User's Manual

Model DY
Vortex Flowmeter
(Integral Type, Remote Type)
Model DYA
Vortex Flow Converter
(Remote Type)

digitalYEWFLO

IM 01F06A00-01EN

vigilantplant.®

YOKOGAWA
Yokogawa Electric Corporation

IM 01F06A00-01EN
15th Edition

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INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT EX-B03E

REVISION RECORD

INTRODUCTION

The DY series of vortex flowmeters have been fine-tuned to your order specifications prior to shipment. Before use, read this manual thoroughly and familiarize yourself fully with the features, operations and handling of digitalYEWFLO to have the instrument deliver its full capabilities and to ensure its efficient and correct use.

■ Notices Regarding This Manual

- This manual should be passed to the end user.
- The contents of this manual are subject to change without prior notice.
- All rights reserved. No part of this document may be reproduced or transmitted in any form or by any means without the written permission of Yokogawa Electric Corporation (hereinafter simply referred to as Yokogawa).
- This manual neither does warrant the marketability of this instrument nor it does warrant that the instrument will suit a particular purpose of the user.
- Every effort has been made to ensure accuracy in the contents of this manual. However, should any questions arise or errors come to your attention, please contact your nearest Yokogawa sales office that appears on the back of this manual or the sales representative from which you purchased the product.
- This manual is not intended for models with custom specifications.
- Revisions may not always be made in this manual in conjunction with changes in specifications, constructions and/or components if such changes are not deemed to interfere with the instrument's functionality or performance.

■ Notices Regarding Safety and Modification

- For the protection and safety of personnel, the instrument and the system comprising the instrument, be sure to follow the instructions on safety described in this manual when handling the product. If you handle the instrument in a manner contrary to these instructions, Yokogawa does not guarantee safety.
- If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- As for explosionproof model, if you yourself repair or modify the instrument and then fail to return it to its original form, the explosion-protected construction of the instrument will be impaired, creating a hazardous condition. Be sure to consult Yokogawa for repairs and modifications.

■ Safety and Modification Precautions

- The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific WARNINGS given elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Yokogawa assumes no liability for the customer's failure to comply with these requirements. If this instrument is used in a manner not specified in this manual, the protection provided by this instrument may be impaired.
- The following safety symbol marks are used in this user's manual and instrument.

⚠ WARNING

A WARNING sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death of personnel.

⚠ CAUTION

A CAUTION sign denotes a hazard. It calls attention to procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the product.

IMPORTANT

An IMPORTANT sign denotes that attention is required to avoid damage to the instrument or system failure.

NOTE

A NOTE sign denotes information necessary for essential understanding of operation and features.

⏚ Functional grounding terminal

⎓ Direct current

Warranty

- The warranty of this instrument shall cover the period noted on the quotation presented to the Purchaser at the time of purchase. The Seller shall repair the instrument free of charge when the failure occurred during the warranty period.
- All inquiries on instrument failure should be directed to the Seller's sales representative from whom you purchased the instrument or your nearest sales office of the Seller.
- Should the instrument fail, contact the Seller specifying the model and instrument number of the product in question. Be specific in describing details on the failure and the process in which the failure occurred. It will be helpful if schematic diagrams and/or records of data are attached to the failed instrument.
- Whether or not the failed instrument should be repaired free of charge shall be left solely to the discretion of the Seller as a result of an inspection by the Seller.

■ The Purchaser shall not be entitled to receive repair services from the Seller free of charge, even during the warranty period, if the malfunction or damage is due to:

- improper and/or inadequate maintenance of the instrument in question by the Purchaser.
- handling, use or storage of the instrument in question beyond the design and/or specifications requirements.
- use of the instrument in question in a location not conforming to the conditions specified in the Seller's General Specification or Instruction Manual.
- retrofitting and/or repair by an other party than the Seller or a party to whom the Seller has entrusted repair services.
- improper relocation of the instrument in question after delivery.
- reason of force measure such as fires, earthquakes, storms/floods, thunder/lightning, or other reasons not attributable to the instrument in question.

■ Using the Vortex Flowmeter Safely

⚠ WARNING

(1) Installation

- Installation of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to installation.
- The vortex flowmeter is a heavy instrument. Be careful that no damage is caused to personnel through accidentally dropping it, or by exerting excessive force on the vortex flowmeter. When moving the vortex flowmeter, always use a trolley and have at least two people carry it.
- When the vortex flowmeter is processing hot fluids, the instrument itself may become extremely hot. Take sufficient care not to get burnt.
- Where the fluid being processed is a toxic substance, avoid contact with the fluid and avoid inhaling any residual gas, even after the instrument has been taken off the line for maintenance and so forth.
- All procedures relating to installation must comply with the electrical code of the country where it is used.

(2) Wiring

- The wiring of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.
- When connecting the wiring, check that the supply voltage is within the range of the voltage specified for this instrument before connecting the power cable. In addition, check that no voltage is applied to the power cable before connecting the wiring.
- The functional grounding must be connected securely at the terminal with the ⏚ mark to avoid danger to personnel.

(3) Operation

- Only expert engineer or skilled personnel are permitted to open the cover.

(4) Maintenance

- Maintenance on the vortex flowmeter should be performed by expert engineer or skilled personnel. No operator shall be permitted to perform any operations relating to maintenance.
- Always conform to maintenance procedures outlined in this manual. If necessary, contact Yokogawa.
- Care should be taken to prevent the build up of dirt, dust or other substances on the display panel glass or data plate. If these surfaces do get dirty, wipe them clean with a soft dry cloth.

(5) Explosion Protected Type Instrument

- For explosion proof type instrument, the description in Chapter 10 “EXPLOSION PROTECTED TYPE INSTRUMENT” is prior to the other description in this user's manual.
- Only trained persons use this instrument in the industrial location.
- The functional grounding ⏚ must be connected to a suitable IS grounding system.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

(6) European Pressure Equipment Directive (PED)

- When using the instrument as a PED-compliant product, be sure to read Chapter 11 before use.
- Do not open the cover in wet weather or high humidity.
  If the cover is opened, provided protection with the enclosure is not warrantable.

■ ATEX Documentation

This procedure is only applicable to the countries in European Union.

GB

All instruction manuals for ATEX Ex related products are available in English, German and French. Should you require Ex related instructions in your local language, you are to contact your nearest Yokogawa office or representative.

DK

Alle brugervejledninger for produkter relateret til ATEX Ex er tilgængelige på engelsk, tysk og fransk. Skulle De ønske yderligere oplysninger om håndtering af Ex produkter på eget sprog, kan De rette henvendelse herom til den nærmeste Yokogawa afdeling eller forhandler.

I

Tutti i manuali operativi di prodotti ATEX contrassegnati con Ex sono disponibili in inglese, tedesco e francese. Se si desidera ricevere i manuali operativi di prodotti Ex in lingua locale, mettersi in contatto con l'ufficio Yokogawa più vicino o con un rappresentante.

E

Todos los manuales de instrucciones para los productos antiexplosivos de ATEX están disponibles en inglés, alemán y francés. Si desea solicitar las instrucciones de estos artículos antiexplosivos en su idioma local, deberá ponerse en contacto con la oficina o el representante de Yokogawa más cercano.

NL

Alle handleidingen voor producten die te maken hebben met ATEX explosiebeveiliging (Ex) zijn verkrijgbaar in het Engels, Duits en Frans. Neem, indien u aanwijzingen op het gebied van explosiebeveiliging nodig hebt in uw eigen taal, contact op met de dichtstbijzijnde vestiging van Yokogawa of met een vertegenwoordiger.

SF

Kaikkien ATEX Ex -tyyppisten tuotteiden käyttöhjeet ovat saatavilla englannin-, saksan- ja ranskankielisinä. Mikäli tarvitsette Ex -tyyppisten tuotteiden ohjeita omalla paikallisella kielellännne, ottakaa yhteyttä lähimpään Yokogawa-toimistoon tai -edustajaan.

P

Todos os manuais de instruções referentes aos produtos Ex da ATEX estão disponíveis em Inglês, Alemão e Francês. Se necessitar de instruções na sua língua relacionadas com produtos Ex, deverá entrar em contacto com a delegação mais próxima ou com um representante da Yokogawa.

F

Tous les manuels d'instruction des produits ATEX Ex sont disponibles en langue anglaise, allemande et française. Si vous nécessitez des instructions relatives aux produits Ex dans votre langue, veuillez bien contacter votre représentant Yokogawa le plus proche.

D

Alle Betriebsanleitungen für ATEX Ex bezogene Produkte stehen in den Sprachen Englisch, Deutsch und Französisch zur Verfügung. Sollten Sie die Betriebsanleitungen für Ex-Produkte in Ihrer Landessprache benötigen, setzen Sie sich bitte mit Ihrem örtlichen Yokogawa-Vertreter in Verbindung.

S

Alla instruktionsböcker för ATEX Ex (explosionssäkra) produkter är tillgängliga på engelska, tyska och franska. Om Ni behöver instruktioner för dessa explosionssäkra produkter på annat språk, skall Ni kontakta närmaste Yokogawakontor eller representant.

GR

Όλα τα εγχειρίδια λειτονργίας των προϊόντων με ATEX Ex διατίθενται στα Αγγλικά, Γερμανικά και Γαλλικά. Σε περίπτωση που χρειάζεστε οδηγίες σχετικά με Ex στην τοπική γλώσσα παρακαλούμε επικοινωνήστε με το πλησιέστερο γραφείο της Yokogawa ή αντιπρόσωπο της.

SK

Všetky návody na obsluhu pre prístroje s ATEX Ex sú k dispozícii v jazyku anglickom, nemeckom a francúzskom. V prípade potreby návodu pre Ex-prístroje vo Vašom národnom jazyku, skontaktujte prosím miestnu kanceláriu firmy Yokogawa.

CZ

Všechny uživatelské příručky pro výrobky, na něž se vztahuje nevýbušné schválení ATEX Ex, jsou dostupné v angličtině, němčině a francouzštině. Požadujete-li pokyny týkající se výrobků s nevýbušným schválením ve vašem lokálním jazyku, kontaktujte prosím vaši nejbližší reprezentační kancelář Yokogawa.

LT

Visos gaminiø ATEX Ex kategorijos Eksploatavimo instrukcijos teikiami anglø, vokieèiø ir prancûzø kalbomis. Norëdami gauti prietaisø Ex dokumentacijà kitomis kalbomis susisiekite su artimiausiu bendrovës “Yokogawa” biuru arba atstovu.

LV

Visas ATEX Ex kategorijas izstrâdâjumu Lietoðanas instrukcijas tiek piegâdâtas angïu, vâcu un franèu valodâs. Ja vçlaties saòemt Ex ierîèu dokumentâciju citâ valodâ, Jums ir jâsazinâs ar firmas Jokogava (Yokogawa) tuvâko ofisu vai pârstâvi.

EST

Kõik ATEX Ex toodete kasutamisjuhendid on esitatud inglise, saksa ja prantsuse keeles. Ex seadmete muukeelse dokumentatsiooni saamiseks pöörduge lähima Iokagava (Yokogawa) kontori või esindaja poole.

PL

Wszystkie instrukcje obsługi dla urządzeń w wykonaniu przeciwwybuchowym Ex, zgodnych z wymaganiami ATEX, dostępne są w języku angielskim, niemieckim i francuskim. Jeżeli wymagana jest instrukcja obsługi w Państwa lokalnym ję zyku, prosimy o kontakt z najbliższym biurem Yokogawy.

SLO

Vsi predpisi in navodila za ATEX Ex sorodni pridelki so pri roki v angliš èini, nemš èini ter francoš èini. È e so Ex sorodna navodila potrebna v vašem tukejnjem jeziku, kontaktirajte vaš najbliši Yokogawa office ili predstaunika.

H

Az ATEX Ex mûszerek gépkönyveit angol, német és francia nyelven adjuk ki. Amennyiben helyi nyelven kérik az Ex eszközök leírásait, kérjük keressék fel a legközelebbi Yokogawa irodát, vagy képviseletet.

BG

Всички упътвания за продукти от серията ATEX Ex се предлагат на английски, немски и френски език. Ако се нуждаете от упътвания за продукти от серията Ex на родния ви език, се свържете с най-близкия офис или представителство на фирма Yokogawa.

RO

Toate manualele de instructiuni pentru produsele ATEX Ex sunt in limba engleza, germana si franceza. In cazul in care doriti instructiunile in limba locala, trebuie sa contactati cel mai apropiat birou sau reprezentant Yokogawa.

M

Il-manwali kollha ta’ l-istruzzjonijiet għal prodotti marbuta ma’ ATEX Ex huma disponibbli bl-Ingliż, bil-Ġermaniż u bil-Franċiż. Jekk tkun teħtieġ struzzjonijiet marbuta ma’ Ex fil-lingwa lokali tiegħek, għandek tikkuntattja lill-eqreb rappreżentan jew uffiċċju ta’ Yokogawa.

1. HANDLING PRECAUTIONS

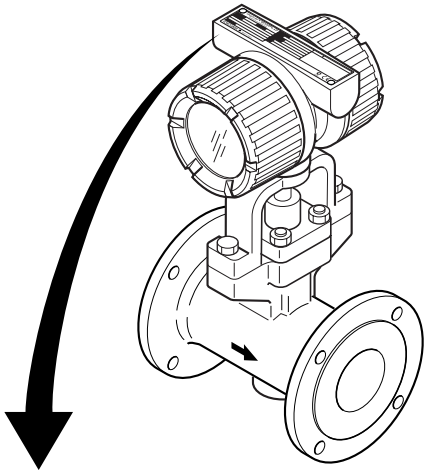
The Model DY Vortex Flowmeter and Model DYA Vortex Flow Converter are thoroughly tested at the factory before shipment. When these instruments are delivered, perform a visual check to ascertain that no damage occurred during shipment.

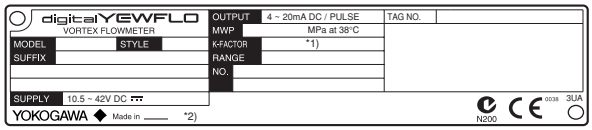
This section describes important cautions in handling these instruments. Read carefully before using them.

If you have any problems or questions, contact your nearest YOKOGAWA service center or sales representative.

1.1 Model and Specifications

The model and important specifications are indicated on the data plate attached to the case. Verify that they are the same as those specified in the original order, referring to paragraph 12.2 to 12.5. In any correspondence, always give model (MODEL), serial number (NO) and calibrated range (RANGE) from the data plate.





*1): K factor at 15°C
*2): The product - producing country.

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Figure 1.1(a) Example of Name Plate for Integral Type

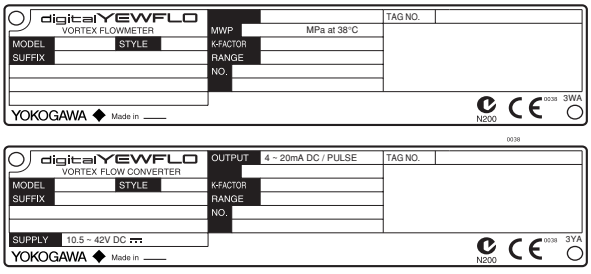

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Figure 1.1(b) Example of Name Plate for Remote Type

1.2 Precautions Regarding Transportation and Storage Location

To protect against accidental damage to digitalYEWFLO while transporting it to a new location, pack it in the original packing as when shipped from the Yokogawa factory.

⚠ WARNING

The Vortex Flowmeter is a heavy instrument. Please be careful to prevent persons from injuring when it is handled.

Deterioration in insulation or corrosion can occur for unexpected reasons if digitalYEWFLO is left uninstalled for a prolonged period after delivery. If digitalYEWFLO is likely to be stored over a prolonged period, observe the following precautions.

- Store the vortex flowmeter with forwarded statement.
- Choose a storage location that satisfies the following requirements:
  - Not exposed to rain or splashwater.
  - Less susceptible to mechanical vibration or shock.
  - Kept within the temperature and humidity ranges shown in the following table, preferably at normal temperature and humidity (approximately 25°C, 65%)

Temperature	–40°C to +80°C
Humidity	5 to 100% (no condensation)

T010201.EPS

1.3 Precautions Regarding Installation Locations

(1) Ambient Temperature

Avoid an area which has wide temperature variations. When the installation area is subjected to heat radiation from process plant, ensure adequate heat prevention or ventilation.

(2) Atmospheric Conditions

Avoid installing the vortex flowmeter in a corrosive atmosphere. When the vortex flowmeter must be installed in a corrosive atmosphere, adequate ventilation must be provided.

(3) Mechanical Shock or Vibration

The vortex flowmeter is of sturdy construction, but select an area subject to minimize mechanical vibrations or impact shock. If the flowmeter is subject to vibrations, it is recommended that pipeline supports to be provided as shown in Figure 1.2.

(4) Other Considerations

- Choose a location where is sufficient clearance around digitalYEWFLO exist to allow such work as routine inspections.
- Choose a location that ensures easy wiring and piping.

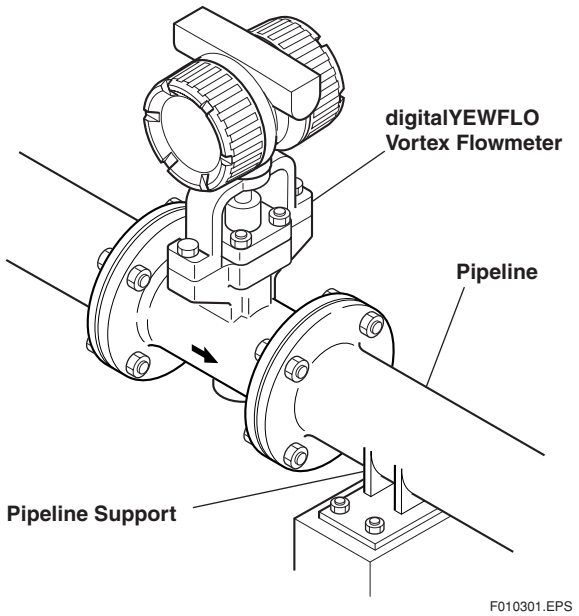


Figure 1.2

2. INSTALLATION

WARNING

This instrument must be installed by expert engineer or skilled personnel. The procedures described in this chapter are not permitted for operators.

2.1 Precautions Regarding Installation Locations

(1) Ambient Temperature

Avoid an area which has wide temperature variations. When the installation area is subjected to heat radiation from process plant, ensure adequate heat prevention or ventilation.

(2) Atmospheric Conditions

Avoid installing the vortex flowmeter in a corrosive atmosphere. When the vortex flowmeter must be installed in a corrosive atmosphere, adequate ventilation must be provided

(3) Mechanical Shock or Vibration

The vortex flowmeter is of sturdy construction, but select an area subject to minimize mechanical vibration or impact shock. If the flowmeter is subject to vibrations, it is recommended that pipeline supports to be provided as shown in Figure 2.1.

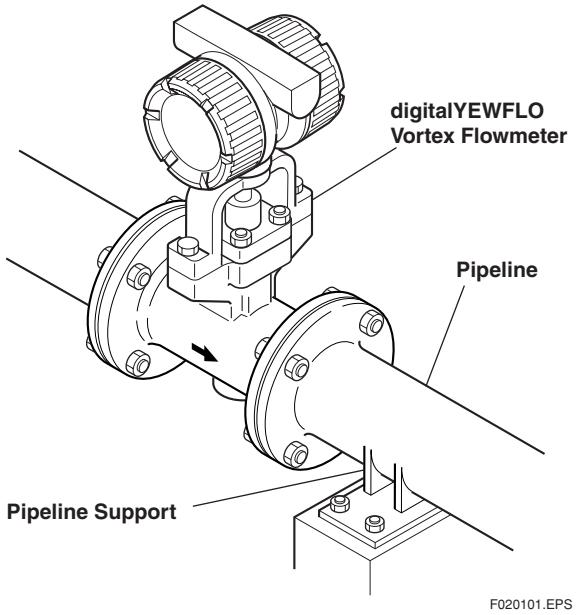


Figure 2.1

(4) Precautions Regarding Piping

(a) Ensure that the process connector bolts are tightened firmly.
(b) Ensure that no leak exists in the process connection pipeline.
(c) Do not apply a pressure higher than the specified maximum working pressure.
(d) Do not loosen or tighten the flange mounting bolts when the assembly is pressurized.
(e) Handle the vortex flowmeter carefully when measuring dangerous liquids, so that the liquids do not splash into eyes or on face. When using dangerous gases, be careful not to inhale them.

2.2 Piping

See Table 2.1 about Valve Position and Straight Pipe Length and so on.

●Piping support

Typical vibration immunity level is 1G for normal piping condition.Piping support should be fixed in case of over 1G vibration level.

●Installation direction

If a pipe is always filled with liquids, the pipe can be installed vertically or at inclined angle.

●Adjacent pipes

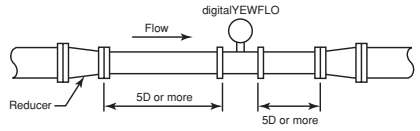
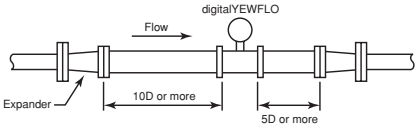
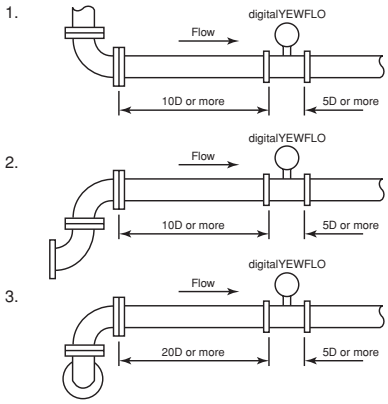
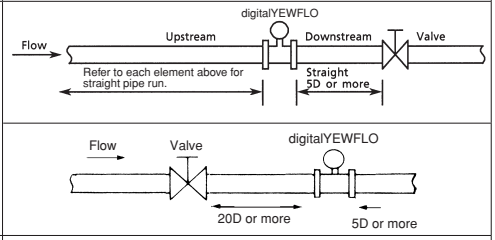
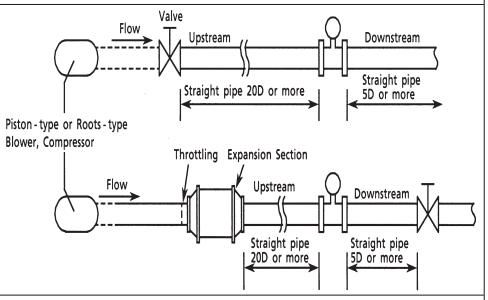
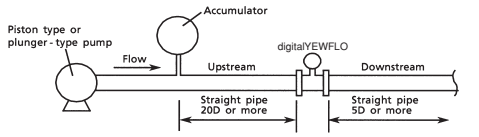
The process pipline inner diameter should be larger than the digitalYEWFLO inner diameter.
Use the following adjacent pipe.

Model Code DY015 up to DY050 : Sch 40 or less.
DY025-/R1 up to DY080-/R1
DY040-/R2 up to DY100-/R2
Model Code DY080 up to DY300 : Sch 80 or less.
DY100-/R1 up to DY200-/R1
DY150-/R2 up to DY200-/R2

●Straight pipe length

*D: piping diameter
*K-factor may be influenced about 0.5% in case that straight pipe length of upstream is less than values below.

Table 2.1 Installation

Description	Figure
Reducer pipe: Ensure the upstream straight pipe length to be 5D or more, and the downstream straight pipe length to be 5D or more for per reducer pipe.	
Expander pipe: Ensure the upstream straight pipe length to be 10D or more, and the downstream straight pipe length to be 5D or more for per expander pipe.	
Bent pipe and straight pipe length: 1. Single bent pipe 2. Double bent pipe; coplanar 3. Double bent pipe; non coplanar	
Valve position and straight pipe length: ■ Install the valve on the downstream side of the flowmeter. The upstream straight pipe length dependent on the element located on the upstream such as reducer/expander, bent and etc., refer to description as above. Keep 5D or more for downstream straight pipe length. ■ In case the valve has to be installed on the upstream of the flowmeter, ensure the upstream straight pipe length to be 20D or more, and the downstream straight pipe length be 5D or more.	
Fluid vibration: For a gas line which uses a position-type or roots-type blower compressor or a high-pressure liquid line (about 1MPa or more) which uses piston-type or plunger-type pump, fluid vibrations may be produced. In these case, install valve on the upstream side of digitalYEWFLO. For inevitable fluid vibration, put a vibration damping device such as throttling plate or expansion section in the upstream side of digitalYEWFLO.	
Piston-type or plunger pump: Install the accumulator on the upstream side of digitalYEWFLO to reduce fluid vibrations.	

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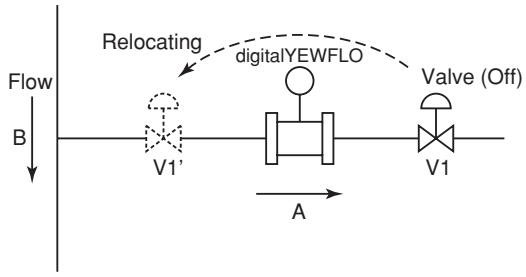
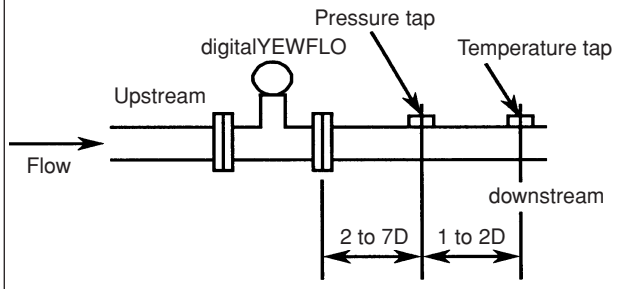
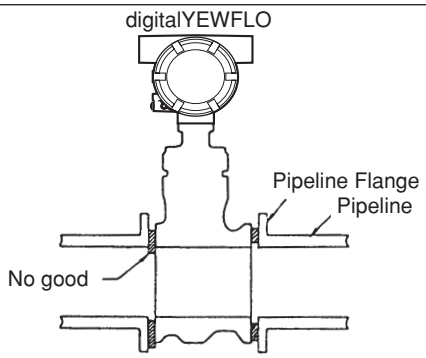
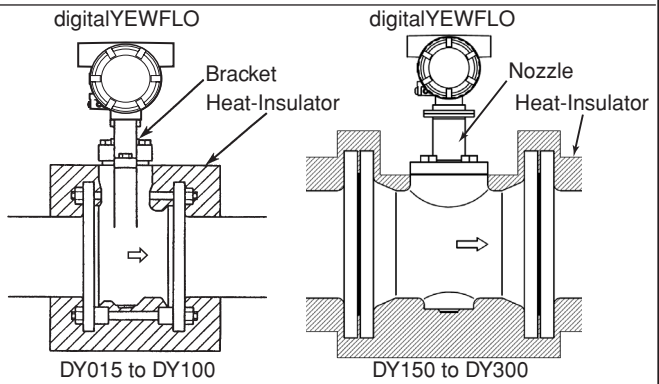
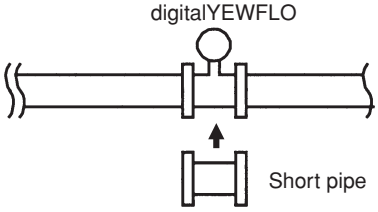
Description	Figure
Valve positon (T-type piping exist): When pulsation causes by a T-type piping exist, install the valve on the upstream of the flowmeter. Example:As shown in the figure, when the valve V1 is turned off, the fluid flow throught B as to meter A the flow is zero. But due to the pulsating pressure is detected, the meter is zero point become fluctuating. To avoid this, change the valve V1 location to V1'. • In case of the Reduced Bore type, moisture may be remained upstream of the flowmeter. Drain it appropriately.	
Pressure and Temperature Taps: Pressure tap outlet: install this tap between 2D and 7D on the downstream side of a flowmeter. Temperature tap outlet: install this on the downstream side 1D to 2D away from a pressure tap.	
Mounting Gasket: Avoid mounting gaskets which protrude into the pipe line. This may cause inaccurate readings. Use the gaskets with bolt holes, even if digitalYEWFLO is the wafer type. When using a spiral gasket(without bolt holes), confirm the size with the gasket -manufacturer, as standard items may not be used for certain flange ratings.	
Heat-Insulation: When an integral-type flowmeter or a remote type detector is installed and the pipe carrying higt-temperature fluids is heat-insulated, do not wrap adiabatic materials around the installation bracket (DY015 to DY100) or the nozzle (DY150 to DY300). • Refer to “2.5 Cryogenic and High Process Temperature Version Insulation” and install it rightly.	
Flushing of the pipe line: Flush and clean scale, incrustation and sludge on the inside of pipe for newly installed pipe line and repaired pipe line before the operation. For flushing, the flow should flow through bypass-piping to avoid damaging the flowmeter. If there is no bypass-piping, install short pipe instead of the flowmeter.	

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2.3 Precautions Regarding Installation

WARNING

In case of high process temperature, care should be taken not to burn yourself because the surface of body and case reach a high temperature.

(1) Gas or Steam Measuring Precautions

- **Piping to Prevent Standing Liquid**
  Mount digitalYEWFLO in a vertical pipeline to avoid liquid traps. When digitalYEWFLO is installed horizontally, raise that part of the pipeline in which the digitalYEWFLO is installed.

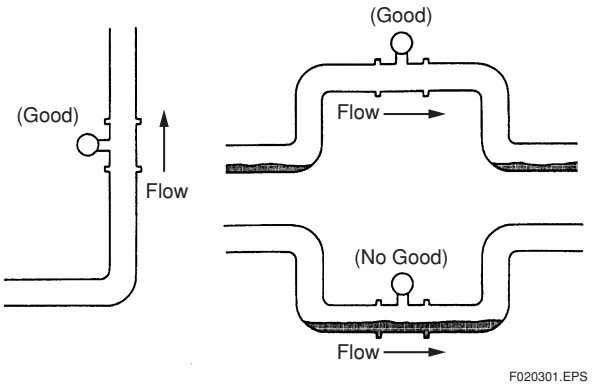


Figure 2.2

(2) Liquid Measurement Precautions

To insure accurate measurement, the digitalYEWFLO must always have a full pipe.

- **Piping Requirements for Proper Operation**
  Allow the flow to flow against gravity. When the flow is moving with gravity, lift the down-stream pipe length above the digitalYEWFLO installation level to maintain full pipeline.

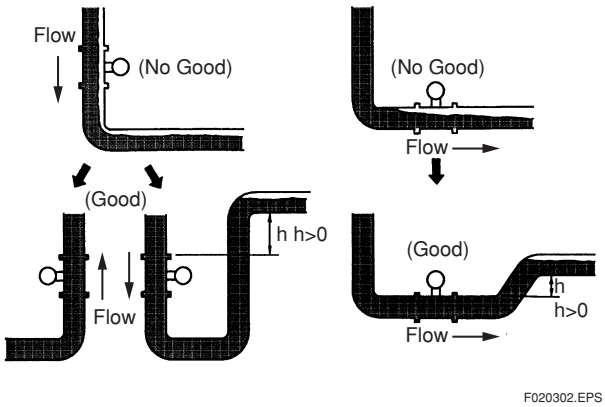


Figure 2.3

- **Piping for Avoiding Bubbles**
  Flows containing both gas and liquid cause problems. Avoid gas bubbles in a liquid flow. Piping should be carried out to avoid bubble generation.
  Install the valve on the downstream side of the flowmeter because pressure drop across the control valve may cause gas to come out of the solution.

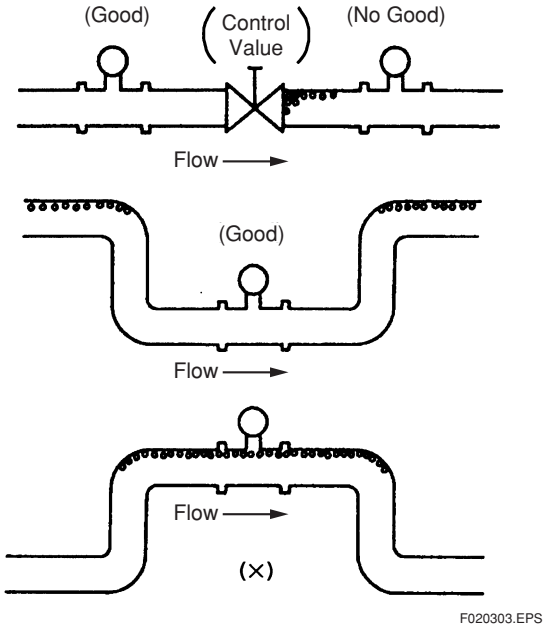


Figure 2.4

(3) Multi-Phase Flow

digitalYEWFLO can measure gas, liquid and steam when there is no change in state. However, accurate measurement of mixed flows (e.g. gas and liquid) is not possible.

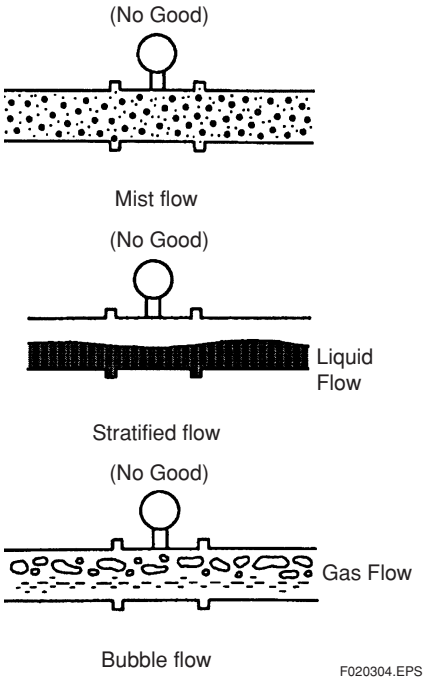


Figure 2.5

(4) Pipeline Diameter and digitalYEWFLO

The process pipeline inner diameter should be slightly larger than the vortex flowmeter inner diameter, schedule 40 or lower pipe should be used for 1/2 to 2 inch flowmeters and schedule 80 or lower pipes for 3 to 8 inch flowmeters.

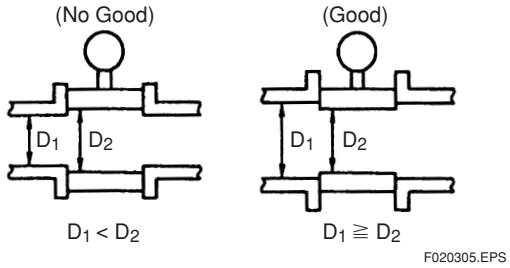


Figure 2.6

(5) Waterproof Construction

The vortex flowmeter is of IP67, NEMA4X tightprotection. However, it cannot be used under water.

2.4 Piping to Improve Durability

(1) Pipe cleaning

- Flushing of pipe line (Cleaning)
  Flush and clean scale, incrustation and sludge on the inside of pipe wall for newly installed pipe line and repaired pipe line before the operation.
- Fluid Carrying Solids
  Do not measure fluids that carry solids (e.g. sand and pebbles). Make sure users periodically remove solids adhering to the vortex shedder.
- Obstruction of flow fluids may cause to make a chemical reaction and the fluid will be crystallized and hardened, and be deposited on the pipe wall and shedder bar.
  In those cases, clean shedder bar.

(2) Bypass piping

Bypass piping is convenient for the maintenance of digitalYEWFLO (vortex shedder cleaning, etc.).

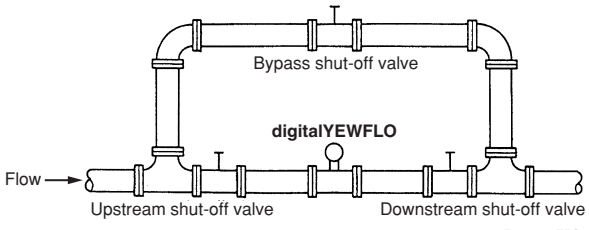


Figure 2.7

2.5 Cryogenic and High process Temperature Version Insulation

When you are using cryogenic type and high process temperature version of digitalYEWFLO Vortex Flowmeter (Option code/HT /LT), refer to illustrated insulation method as shown in Figure 2.8

(1) Installing Cryogenic Vortex Flowmeter

For cryogenic applications, use stainless steel mounting bolts and nuts to install the flowmeter. These can be ordered separately from YOKOGAWA. Cover the flowmeter body with heat insulating material so that the flowmeter can be maintained at ultra-low temperatures (refer to the Figure 2.8).

(2) Maintenance for Cryogenic Applications

DY/LT uses special materials that produce vortex flowmeter for cryogenic applications. When you are replacing a shedder bar, specify cryogenic type shedder bar. To avoid condensing in the terminal box, ensure that the wire connecting port is well sealed.

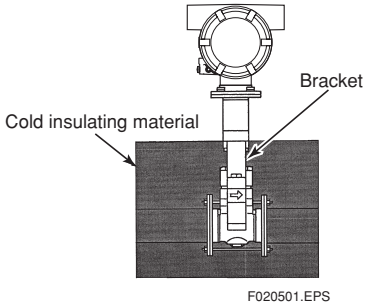


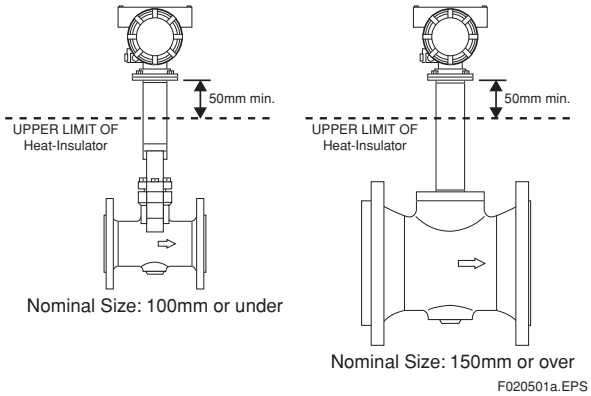
Figure 2.8

(3) Installing High Process Temperature Vortex Flowmeter

Installation of the flowmeter is the same as the standard type. Cover the flowmeter body with heat insulating material following instruction of “CAUTION”.

⚠ CAUTION

Keep the upper limit of heat insulating material to prevent overheating of the terminal box.
Seal the Heat-Insulator to avoid hot-air leakage.



(4) Maintenance for High Process Temperature Applications

DY/HT uses special materials that produce vortex flowmeter for High Process Temperature applications When you are replacing a shedder bar or a gasket, specify High Process Temperature type.

2.6 Installing the Vortex Flowmeter

WARNING

The Vortex Flowmeter is a heavy instrument. Please be careful to prevent persons from injuring whin it is handled.

Before installing the instrument verify the following. The direction of flow should match to the arrow mark on the instrument body. When changing the orientation of the terminal box, refer to "10.1."

Installation of Vortex flowmeter of the wafer and flange type is shown in Table 2.3.

When installing the wafer type vortex flowmeter, it is important to align the instrument bore with the inner diameter of the adjacent piping.

To establish alignment, use the four collars supplied with the instrument.

1. Four collars are supplied for 1/2 inch (15mm) to 1- 1/2inch (40mm), 2 inch of JIS 10K or ANSI class 150 or JPI class 150, and 3 inch of ANSI class 150 or JPI class 150. Install the instrument as illustrated in Table 2.2.
2. If the adjacent flanges have eight bolt holes, insert the stud bolts in the holes on the instrument shoulder. Refer to Figure 2.9.
   Stainless steel stud bolts and nuts are available on order. When they are to be supplied by the user, refer to Table 2.2 for stud bolt length. Gaskets must be supplied by the user.
3. Gasket:
   Avoid mounting gaskets which protrude into the pipeline. This may cause inaccurate readings.
   Use gaskets with bolt holes, even if digitalYEWFLO is of the wafer type. Refer to Figure 2.10.
   When using a spiral gasket (without bolt holes), confirm the size with the gasket-manufacturer, as standard items may not be used for certain flange ratings.

Table 2.2

Size mm (inch)	Flange Rating	Major Diameter of External Threed of Stud Bolt d (mm)	Length ℓ (mm)
15mm (1/2B)	JIS 10K, 20K/DIN 10, 16,25,40	12	160
	JIS 40K	16	160
	ANSI 150, 300, 600	12.7	155
25mm (1B)	JIS 10K, 20K, 40K	16	160
	ANSI 150	12.7	155
	ANSI 300, 600	15.9	160
	DIN 10, 16, 25, 40	12	160
40mm (1-1/2B)	JIS 10K, 20K/DIN 10, 16, 25, 40	16	160
	JIS 40K	20	170
	ANSI 150	12.7	155
	ANSI 300, 600	19.1	170
50mm (2B)	JIS 10K, 20K, 40K/ DIN 10, 16, 25, 40	16	200
	ANSI 150, 300, 600	15.9	
80mm (3B)	JIS 10K/DIN 10, 16, 25, 40	16	220
	JIS 20K, 40K	20	240
	ANSI 150	15.9	
	ANSI 300, 600	19.1	
100mm (4B)	JIS 10K/DIN 10, 16	16	220
	JIS 20K/DIN 25, 40	20	240
	JIS 40K	22	270
	ANSI 150	15.9	240
	ANSI 300	19.1	240
	ANSI 600	22.2	270

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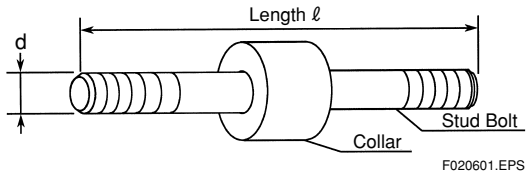


Figure 2.9

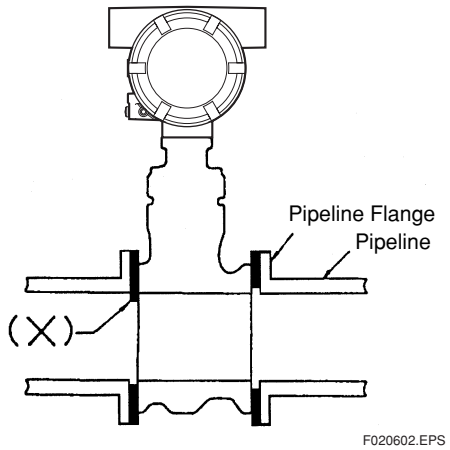


Figure 2.10

Table 2.3(a) Installation of Wafer Type Vortex Flowmeter

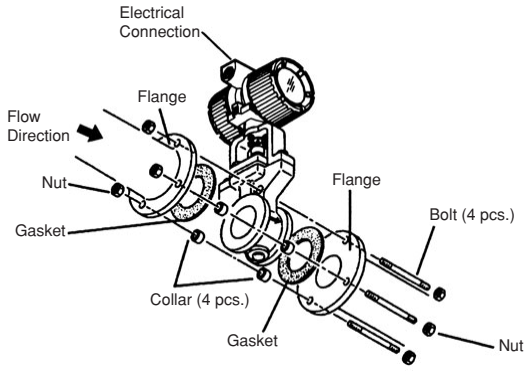
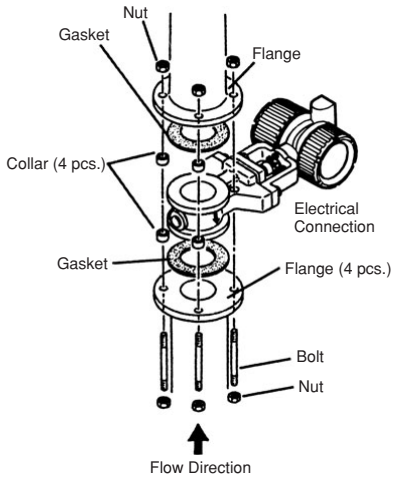
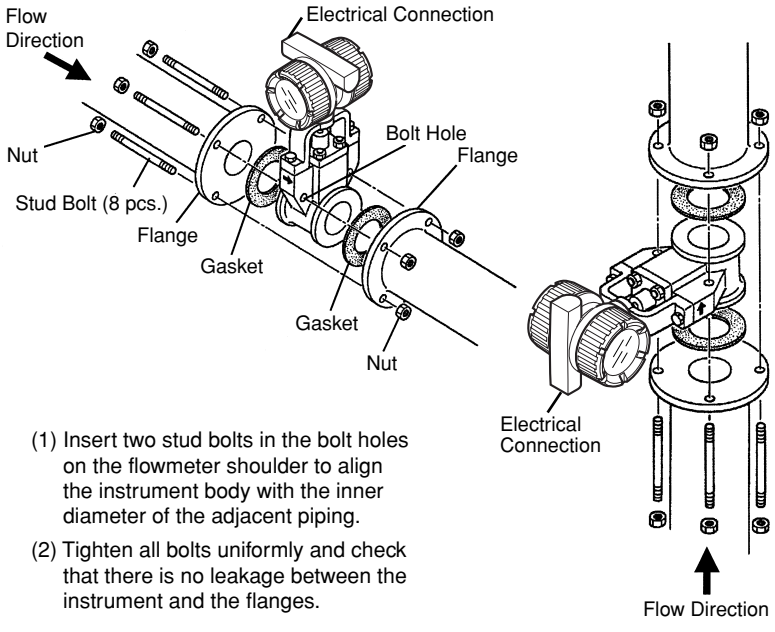
Wafer type	Description
When Installation Collar are required, the installation vortex flowmeters applied to the following line sizes and flange ratings. Size mm(inch) / Flange Rating 15 to 40 (1/2 to 1-1/2) / All ratings 50(2) / JIS 10K, ANSI class 150, DIN PN10 to PN40 80(3) / ANSI class 150, JPI class 150 **⚠ WARNING** The inside diameter of the gasket must be larger than the pipe inner diameter so that it will not disturb the flow in the pipeline. **⚠ WARNING** When installing the Flowmeter vertically in the open air, change the electrical connection port direction to the ground. If the electrical connection port is installed upwards, rain water might leak in. **⚠ WARNING** In case of vertical installation, two collars in the upper part might move after the installation. But it doesn't influence the performance, please use the flowmeter under such condition.	**Horizontal Installation**  **Vertical Installation**  (1) Insert two collars on each two bolts of bottom side of the flowmeter. (2) Fit the flowmeter body to the collars. And tighten the four bolts and nuts uniformly. (3) Check for leakage from the flange connections.
When Installation Collars are not required,the installation vortex flowmeters applied to the following line sizes and flanges. Size mm(inch) / Flange Rating 50(2) / JIS 20K, 40K ANSI class 300,600 JPI class 300,600 80(3) / JIS 10K, 20K, 40K ANSI class 300, 600 JPI class 300,600 100(4) / JIS 10K, 20, 40K ANSI class 150, 300, 600 JPI class 150,300,600	**Horizontal Installation** **Vertical Installation**  (1) Insert two stud bolts in the bolt holes on the flowmeter shoulder to align the instrument body with the inner diameter of the adjacent piping. (2) Tighten all bolts uniformly and check that there is no leakage between the instrument and the flanges.

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Table 2.3(b) Installation of Flange Type Vortex Flowmeter

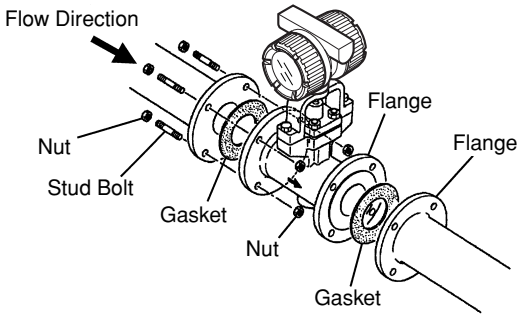
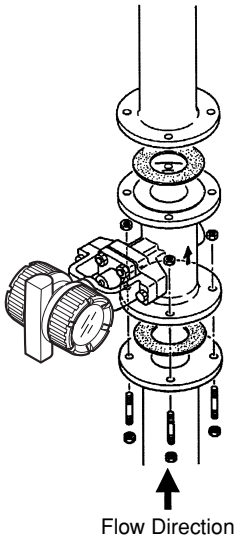
Flange type	Description
Use the stud bolts and nuts supplied with the flowmeter of the user. The gaskets should be supplied by the user. ⚠ **CAUTION** The inside diameter of the gasket must be larger than the pipe inner diameter so that it will not disturb the flow in the pipeline.	**Horizontal Installation**   **Vertical Installation**

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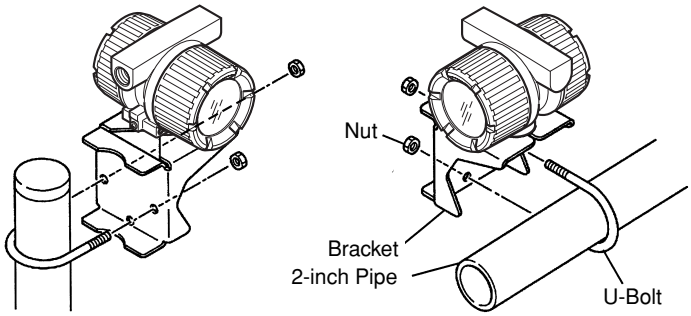
Table 2.3(c) Installation of remote Type Converter

Remote type converter	Description
⚠ **CAUTION** A signal cable (DYC) is used between the remote type flowmeter and the converter. The maximum signal cable length is 97.5ft (30m).	The converter is mounted on a 2-inch (60.5mm outer dia.) stanchion or horizontal pipe. Do not mount the converter on a vertical pipe. It makes wiring and maintenance difficult. The converter mounting orientation can be changed as illustrated below. **Stanchion Mounting** **Horizontal Pipe Mounting** 

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3. WIRING

WARNING

The wiring of the vortex flowmeter must be performed by expert engineer or skilled personnel. No operator shall be permitted to perform procedures relating to wiring.

CAUTION

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

3.1 Wiring Precautions

Be sure to observe the following precautions when wiring:

CAUTION

- In cases where the ambient temperature exceeds 50°C (122°F), use external heat-resistant wiring with a maximum allowable temperature of 70°C (158°F) or above.
- Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
- Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
- All the cable ends must be provided with round crimp-on terminals and be securely wired.
- Be sure to turn power off before opening the cover.
- Before turning the power on, tighten the cover securely.
- Explosion protected types must be wired in accordance with specific requirement (and, in certain countries, legal regulations) in order to preserve the effectiveness of their explosion protected features.
- The terminal box cover is locked by the clamp. In case of opening the terminal box cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the clamp using the hexagonal wrench attached after installing the cover.

3.2 Wiring for Output Condition

Table 3.1 shows the connection method of several output conditions.

(1) Analog Output (4 to 20 mA DC)

This converter uses the same two wires for both, the signal and power supply. A DC power supply is required in a transmission loop. The total leadwire resistance including the instrument load and power distributor (supplied by the user) must conform to a value in the permissible load resistance range. Refer to Figure 3.1 shows.

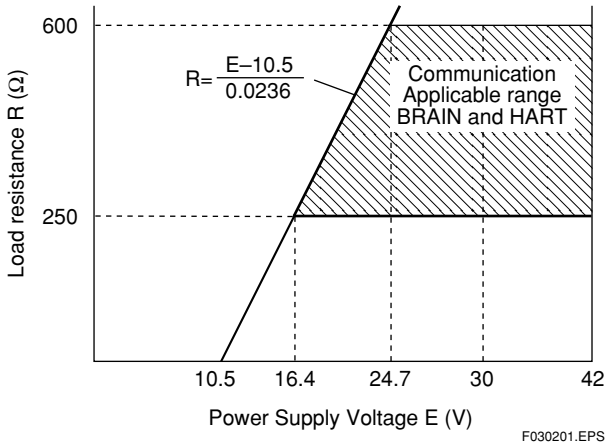


Figure 3.1 Relationship between Power Supply Voltage and Load Resistance (4 to 20 mA DC Output)

(2) Pulse output and Alarm, Status Output

This version uses three wires between the converter and the power supply. A DC power and load resistance are required, and pulse output is connected to a totalizer or an electric counter. Low level of the pulse output is 0 to 2V. No communication is possible over a transmission line. Communication via the amplifier board is always possible irrespective of the wiring condition.

(3) Simultaneous Analog-Pulse Output

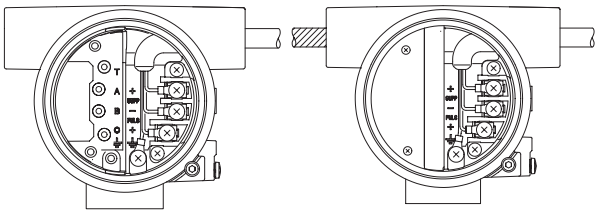
When using digitalYEWFLO in the simultaneous analog -pulse output mode, the communicable distance of the transmission line is restricted on the wiring method. Table 3.1 shows the examples of connection for this output mode. Communication via the amplifier board is always possible irrespective of the wiring condition.

IMPORTANT

For pulse output and the simultaneous analog-pulse output ,use the load resistance. Refer to Table 3.1.

3.3 Connection

Table 3.1 shows the connection sample of connection for power supply and load resistance. The terminal position of each connection is shown in Figure 3.2.



Integral type Remote type

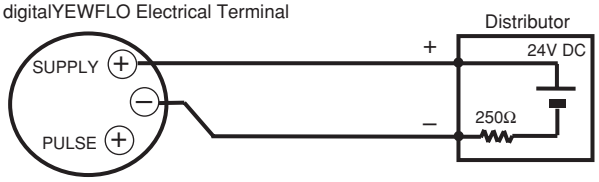
T	Input Terminal from built-in temperature sensor	Supply + −	4 to 20 mA DC Output Power Supply and Output Signal Terminals
A B	Input Terminals from vortex detector	Pulse +	Pulse Output Terminal
C	Common Terminal	⏚	Grounding Terminal

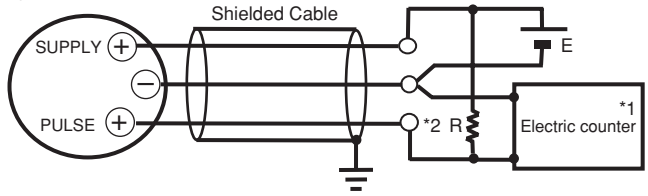
F030301.EPS

Figure 3.2

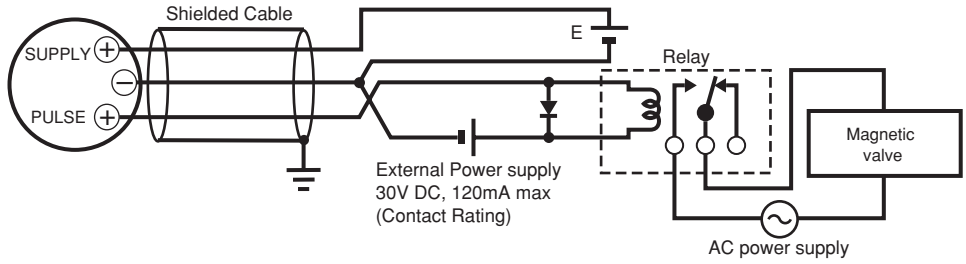
Table 3.1 The connection example for simultaneous analog and pulse and alarm, status output.

<table>
<tr><th>Connection</th><th>Description</th></tr>
<tr><td>Analog Output

In this case,
Communication is possible (up to a distance of 2km when a CEV cable is used.)</td><td>digitalYEWFLO Electrical Terminal
 
</td></tr>
<tr><td>Pulse Output

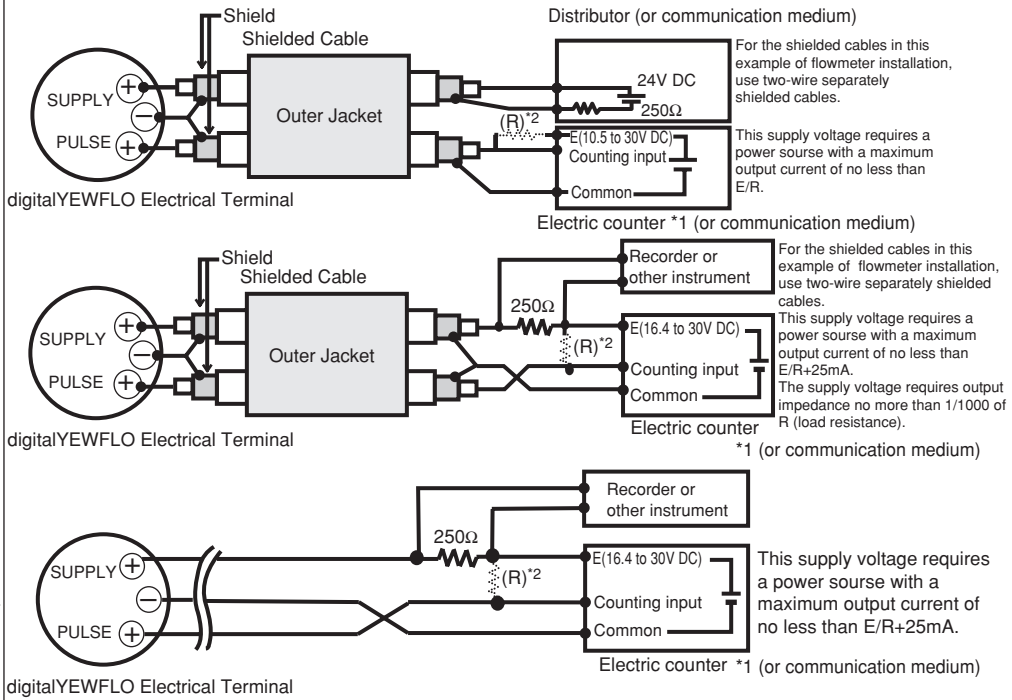
In this case,
No communication is possible.</td><td>digitalYEWFLO Electrical Terminal
Use the Three-wire shielded cable.
 

This supply voltage requires a power sourse with a maximum output current of no less than E/R+25mA.</td></tr>
<tr><td>Status Output
Alarm Output

In this case,
No communication is possible.</td><td>digitalYEWFLO Electrical Terminal
Use the Three-wire shielded cable.
 
</td></tr>
<tr><td>Simultaneous Analog -Pulse Output *3

Example 1
In this case, Communica -tion is possible(up to a distance of 2km when a CEV cable is used).

Example 2
In this case, Communica -tion is possible (up to a distance of 200m when a CEV cable is used) and R = 1kΩ).

Example 3
In this case, No communi -cation is possible (when shielded cable is not used).</td><td>When analog and pulse output are used, the length of communication line is subjected to wiring conditions. Refer to example 1 to 3. If the communication carries out from amplifier, no need to consider wiring conditions.
 
</td></tr>
<tr><td>The range of load resistance R for the pulse output.</td><td>The load resistance should be selected by calculation as shown below.
$\frac{E\ (V)}{120} \leqq R\ (k\Omega) \leqq \frac{0.1}{C\ (\mu F) \times f\ (kHz)}$
Example of CEV cable capacitance ≒ 0.1μF/km
$P\ (mW) = \frac{E^2\ (V)}{R\ (k\Omega)}$
Where
E = Supply voltage (V)
f = Frequency of pulse output (kHz)
R = Value of load resistance (kΩ)
C = Cable capacitance (μF)
P = Power ratio of the load resistance (mW)</td></tr>
</table>

*1 : To avoid the influence of external noise, use an electric counter which fits to the pulse frequency.

T030301.EPS

*2 : Resistor is not necessary in case of an electric counter which can receive contact pulse signal directly.

*3 : When using analog and pulse output simultaneously, the HART communication may be influenced by noise comparing analog output only.

3.4 Wiring Cables and Wires

The following should be taken into consideration when selecting cables for use between the converter and distributor.

(1) Use 600V PVC insulated wire or equivalent standard wire or cable.
(2) Use shielded wire in areas susceptible to electrical noise (both analog and pulse output versions).
(3) In areas with high or low ambient temperatures, use wires or cables suitable for such temperatures.
(4) In atmospheres where oils or solvents, corrosive gases or liquids may be present, use suitable wires or cables.
(5) Use cable which withstand temperature up to 60°C and more, when ambient temperature is more than 60°C.

IMPORTANT

For the remote type, use DYC signal cable to connect the converter and remote type flowmeter(DY-N).

3.5 Connection of the Remote Type Signal Cable

The remote type signal cable is shown in Figure 3.3 and 3.4, and the terminal is shown in Figure 3.5.

The maximum cable length is 30 m (97.5 feet).

Remove terminal box cover and wiring connection dust-cap before wiring.

For remote type the converter has two electrical connections (cable inlets). Use the left connection as viewed from the terminal box for the DYC signal cable and the right connection for the transmission cable.

If a signal cable kit is supplied by YOKOGAWA, both ends of the cable must be finished in accordance with the following instructions as shown in 3.6.1 and 3.6.2.

CAUTION

After completing the signal cable connections, install the shielded cover to signal cable terminal as shown in Figure 3.6.

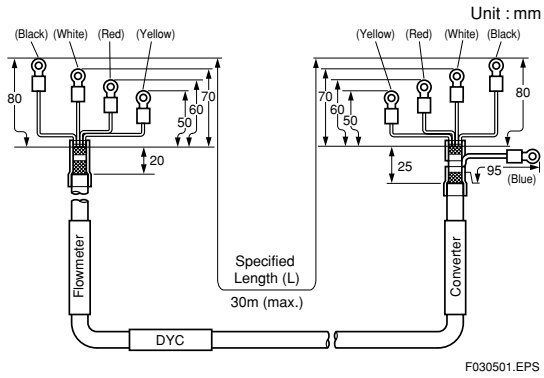


Figure 3.3 DYC Signal Cable

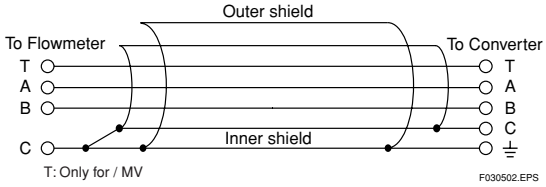
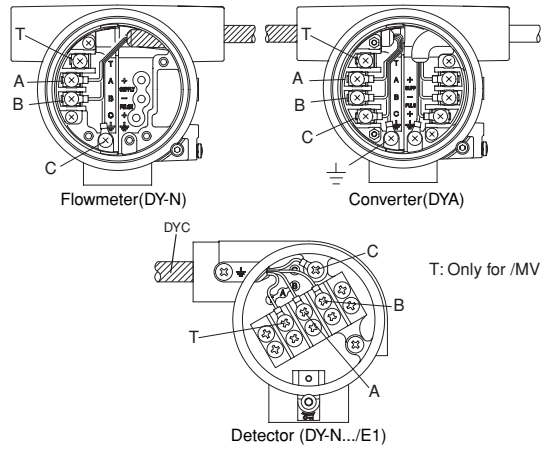


Figure 3.4 Construction of Remote Type Signal Cable



T	Input Terminal from built-in temperature sensor	Supply + −	4 to 20 mA DC Output Power Supply and Output Signal Terminals
A B	Input Terminals from vortex detector	Pulse +	Pulse Output Terminal
C	Common Terminal	⏚	Groundng terminal

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Figure 3.5 Terminal of Detector and Converter

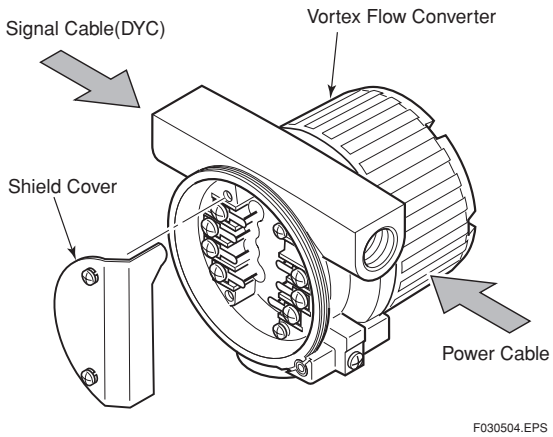
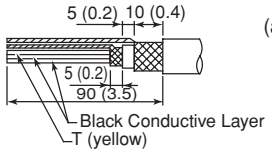
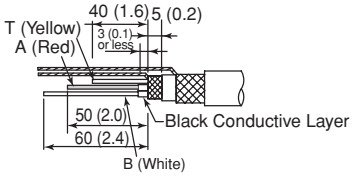
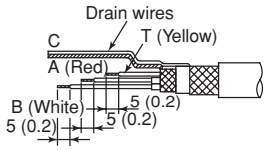
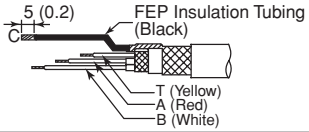
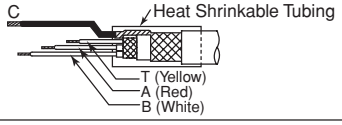
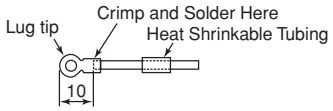
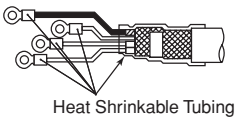


Figure 3.6 Shielded Cover

3.6 Method of Finishing the Signal Cable End(DYC)

3.6.1 For Vortex Flowmeter (DY-N)

	Description	Figure
1	Strip off the outer polyethylene jacket, outer braided shield and inner jacket, and inner braided shield as per the dimensions below.	Unit : mm (approx. inches) 
2	Strip off the black conductive layer convering two wires completely, as per the dimensions below. Twist each of the conductor and drain wires so that there are no free strands.	
3	Do not short-circuit the conductive layer and the terminals (A, B, C and T).	
4	Strip off about 5 mm (0.2 in.) of insulation for each of wires A, B, and T, and twist the strands of each wire. Twist the inner and outer drain wires together.	
5	Slide FEP (fluorinated ethylene propylene) tubing over the twisted inner and outer drain wires C until the tubing cannot be slid any further, and then cut off the tubing leaving 5 mm (0.2 in.) of the stranded drain wires exposed.	
6	Slide heat shrinkable tubing over the cable end so that the tubing covers the braided shield and overlaps both the polyethylene jacket and loose wires A, B, C, and T.	
7	Slide a short piece of heat shrinkable tubing over each of wires A, B, C, and T. Install a crimp-on terminal lug at the tip of each wire. Crimp and solder each lug.	
8	Slide each short piece of heat shrinkable tubing over the crimp sleeve. Heat all pieces of heat shrinkable tubing with a heat blower or dryer.	
9	Attach an identification label to the end of the cable. **NOTE** Check that the insulation resistance between each wire including the inner shield is 10MΩ or greater at 500V DC. Ensure that both ends of the wires are disconnected (open-circuited) during the check.	

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(*1): Only for /MV

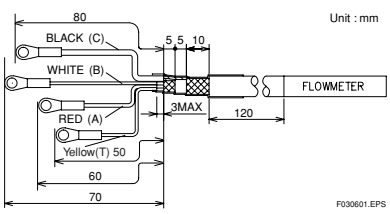


Figure 3.7

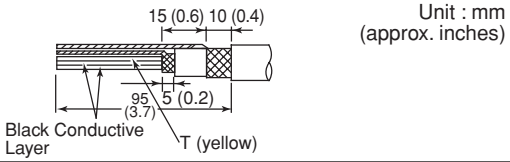
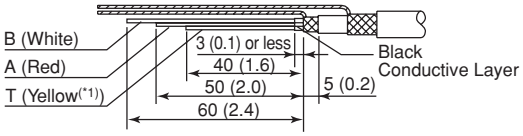
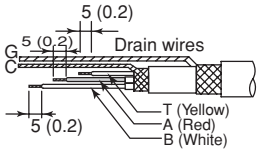
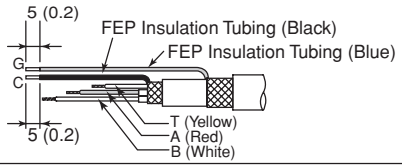
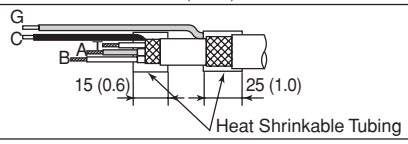
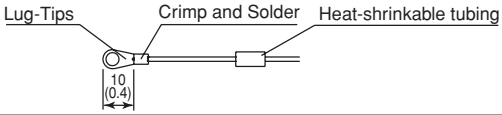
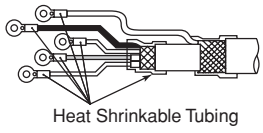
NOTE

In case that the cable end finish parts assembly is necessary after delivery, contact your nearest Yokogawa sales office or the sales representative from which you purchased the product.

CAUTION

Do not touch the " conductive layer" (black area covering the signal cables A and B) to the converter case, terminal, and other leadwires. If it is touched, operation of the converter may be incorrect. When the cable is terminated, remove the conductive layer properly.

3.6.2 For Vortex Flow Converter (DYA)

	Description	Figure
1	Strip off the outer polyethylene jacket, outer braided shield and inner jacket, and inner braided shield as per the dimensions as shown.	
2	Cut of the black conductive layers(convering the two wires) completely, as per the dimensions below. Twist each of the conductor and drain wires so that there are no free strands.	
3	Do not short-circuit the conductive layer and the terminals (A, B, C, G and T).	
4	Strip off about 5 mm (0.2 in.) of insulation for each of wires A, B, and T, and twist the strands of each wire.	
5	Slide black FEP (fluorinated ethylene propylene) tubing over the inner shield drain wire C and blue FEP tubing over outer shield drain wire G until the tubing cannot be slid any further, and then cut off the tubing leaving 5 mm (0.2 in.) of the drain wires exposed.	
6	Slide heat shrinkable tubing over the cable end so that the tubing covers the braided shield and overlaps both the polyethylene jacket and loose wires A, B, C, G, and T.	
7	Slide a short piece of heat shrinkable tubing over each of wires A, B, C, G, and T. Install a crimp-on terminal lug at the tip of each wire. Crimp and solder each lug.	
8	Slide each short piece of heat shrinkable tubing over the crimp sleeve. Heat all pieces of heat shrinkable tubing with a heat blower or dryer.	
9	Attach an identification label to the end of the cable. **NOTE** Check that the insulation resistance between each wire including the inner shield is 10MΩ or greater at 500V DC. Ensure that both ends of the wires are disconnected (open-circuited) during the check.	

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(*1): Only for /MV

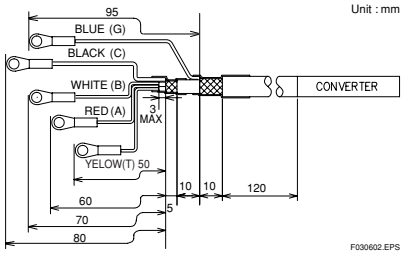

Figure 3.8

NOTE

In case that the cable end finish parts assembly is necessary after delivery, contact your nearest Yokogawa sales office or the sales representative from which you purchased the product.

CAUTION

Do not touch the " conductive layer" (black area covering the signal cables A and B) to the converter case, terminal, and other leadwires. If it is touched, operation of the converter may be incorrect. When the cable is terminated, remove the conductive layer properly.

3.7 Wiring Cautions

NOTE

Once all wiring is complete, check the connections before applying power to the instrument. Improper arrangements or wiring may cause a unit malfunction or damage.

(1) Lay wiring as far as possible from electrical noise sources such as large capacity transformers, motors, and power supplies.
(2) Remove the terminal cover and dustproof plug of an electrical connection before wiring. When you open the cover of explosion proof type(*), turn the clamp to the right, and unlock. When you close a cover after wiring, be sure to turn the clamp to the left and lock.
(*)Flameproof(TIIS,ATEX,IECEx), Intrinsically safe(SAA), Type n(ATEX)
(3) It recommends using an flexible metal conduit and a duct for waterproofing or external protection of an electric wire. See Figure 3.9 or 3.10.
(4) The flameproof packing adapter (optional code: /G11 or G12) should be used for the external wiring of TIIS Flameproof. Refer to EX-B03E “INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAME-PROOF EQUIPMENT”.

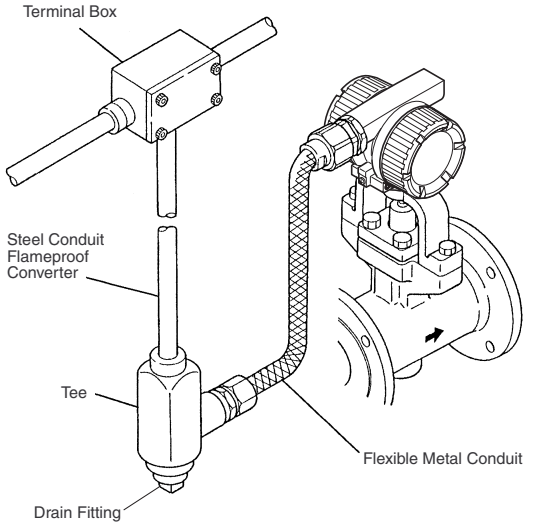

Figure 3.9

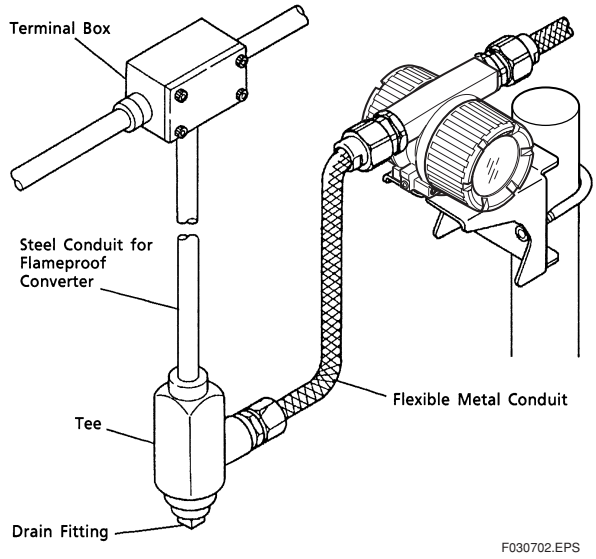

Figure 3.10

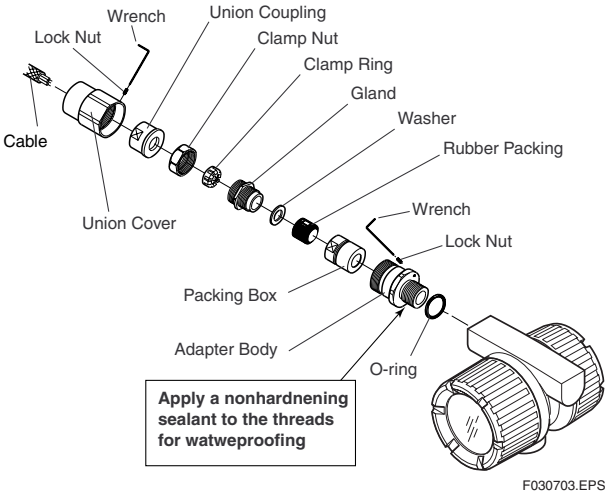

Figure 3.11

NOTE

Be sure to use the flameproof packing adapter (optional code:/G11 or /G12) for TIIS flameproof type at the time of cable wiring work.

Table 3.2 Flameproof packing adaptor

Optional Code	Diameter for screw	Cable Diameter (mm)	Identification mark	Parts NO.
G11 G12	G1/2	ϕ 8.0 to 10.0 ϕ10.0 to 12.0	16 8-10 16 10-12	G9601AM

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(5) Perform attachment of flameproof packing adaptor in the following ways. See figure 3.11.
  (a) Loosen the locking screw and remove the terminal box cover.
  (b) Measure the cable outer diameter in two directions to within 0.1 mm.
  (c) Calculate the average of the two diameters, and use packing with an internal diameter nearest to this value (see Table 3.2).

(d) Screw the flameproof packing adapter into the terminal box until the O-ring touches the wiring port (at least 6 full turns), and firmly tighten the lock nut.
(e) Insert the cable through the union cover, the union coupling, the clamp nut, the clamp ring, the gland, the washer, the rubber packing, and the packing box, in that order.
(f) Insert the end of the cable into the terminal box.
(g) Tighten the union cover to grip the cable. When tightening the union cover, tighten approximately one turn past the point where the cable will no longer move up and down.
Proper tightening is important. If it is too tight, a circuit break in the cable may occur; if not tight enough, the flameproof effectiveness will be compromised.
(h) Fasten the cable by tightening the clamp nut.
(i) Tighten the lock nut on the union cover.
(j) Connect the cable wires to each terminal.

(6)
(a) Do not connect cables outdoors in wet weather in order to prevent damage from condensation and to protect the insulation.
(b) Do not splice the cable between the flowtube terminal and the converter if it is too short. Replace the short cable with a cable that is the appropriate length.
(c) The signal cables must be routed in separate steel conduit tubes 16 (JIS C 8305) or flexible conduit tubes 15 (JIS C 8309).
(d) Always route the power and output signal cables in separate steel conduit tubes, except when the power supply voltage is 24 V and four-core cables are used for wiring. Keep conduits or flexible tubes water-tight using sealing tape.
(7) For the TIIS flameproof type with wiring using a flameproof packing adapter, wire cables through the packing adapters approved by Yokogawa (optional code G11 or G12).

3.8 Grounding

IMPORTANT

When a lightning protector (option code: /A) is selected, use a grounding resistance of 10Ω or less.

(1) The grounding terminals ⏚ are located on the inside and outside of the terminal area. Either terminal may be used.
(2) For pulse output version, ground the flowmeter. Also ground the shielded cable between the converter and the pulse receiver.
(3) Grounding should satisfy Class D requirements (ground resistance 100Ω or less).
(4) Use 600V PVC insulated wire for grounding.

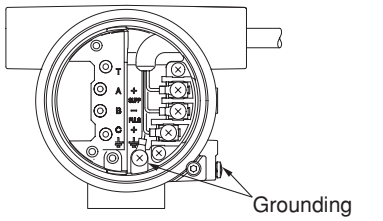

Figure 3.10

4. BASIC OPERATING PROCEDURES

Data setting can be performed with the three keys on the front panel (SET,SHIFT and INC) or using a handheld BRAIN(BT200) terminal and HART communicator.

4.1 Construction of the Display

Figure 4.1 shows the configuration of the digitalYEWFLO display panel (if equipped).

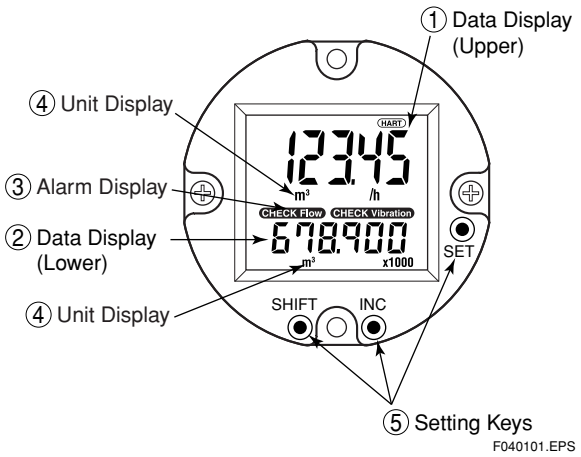

Figure 4.1 Construction of the Display

①	Data Display(Upper)	: flowrate data, setting data, total data and temperature data (/MV).
②	Data Display(Lower)	: total data, alarm data and temperature data (/MV).
③	Alarm Display	: alarm of a flow error and a vibration error.
④	Unit Display	: flowrate unit.
⑤	Setting Keys	: These keys are used to change flow rate data displays and type of setting data.

4.2 Display Contents in Display Section

The display content items are classified in the following three items.

Table 4.2 Mode Name List

Mode (status) Name	Display Contents
Flowrate display mode	A mode in which instantaneous flow rates or totalized values are displayed. Display content is usually selected either in display content selection mode or by setting parameters via BRAIN communication.
Setting mode	In this mode, parameter contents are confirmed or data is updated using the setting section. The mode is changed to this mode when [SET] key is pressed in normal mode.
Alarm number display mode	This mode is overlapped when an alarm is occurring in display mode. The alarm number presentation to indicate alarm contents (about 2 sec) and the normal data display (about 4 sec) are repeated alternatively.

Mode represents that the system is in a state where the relevant setting or display is possible.

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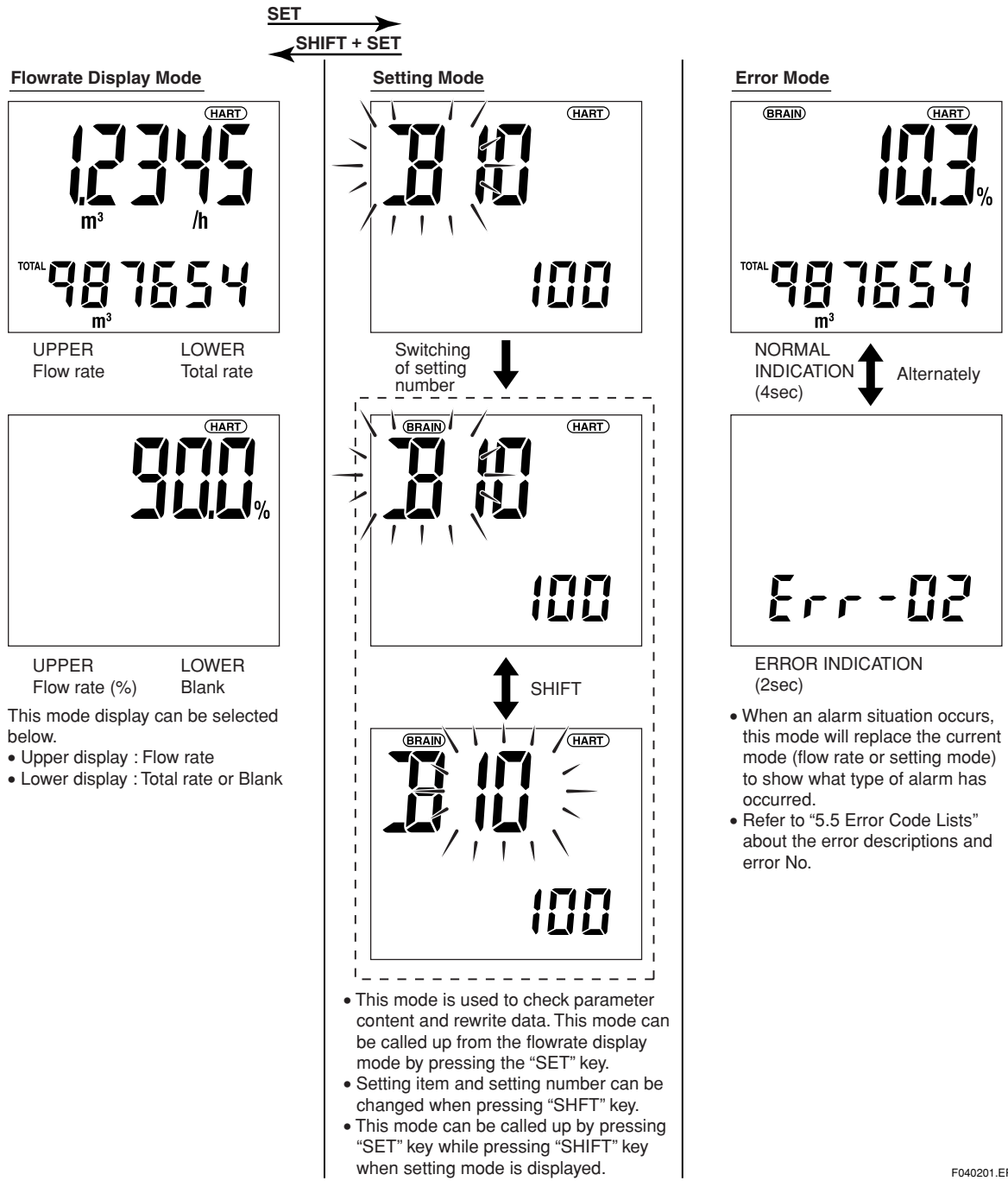
● Display Example



This mode display can be selected below.
- Upper display : Flow rate
- Lower display : Total rate or Blank

- This mode is used to check parameter content and rewrite data. This mode can be called up from the flowrate display mode by pressing the “SET” key.
- Setting item and setting number can be changed when pressing “SHFT” key.
- This mode can be called up by pressing “SET” key while pressing “SHIFT” key when setting mode is displayed.

- When an alarm situation occurs, this mode will replace the current mode (flow rate or setting mode) to show what type of alarm has occurred.
- Refer to “5.5 Error Code Lists” about the error descriptions and error No.

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4.3 Display Contents in Display Section

The display mode is a mode in which instantaneous flow rates or totalized flow are displayed. In display mode, there are three display modes as shown in Table 4.3.

Table 4.3 Display Mode

Name	Contents	Upper Display	Lower Display
% Display (Flow rate)	Instantaneous % flow rate is displayed.	○	×
Engineering Display Unit	Instantaneous flow rate in an engineering unit is displayed.	○	×
Totalized Display	Totalized flow displayed without indicating the decimal point.	×	○
% Display (Temperature) (*1)	Instantaneous temperature is displayed. In this case, "t" is displayed simultaneously (Refer to Figure 4.2).	○	×
Temperature display(*1)	Temperature value is displayed.	×	○
Blank	—	×	○

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(*1) When option code /MV is selected, this function is available.

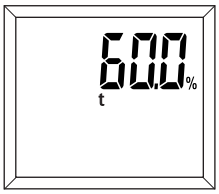

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Figure 4.2 Example

Display mode can be changed using the BT200 terminal or the indicator setting section.

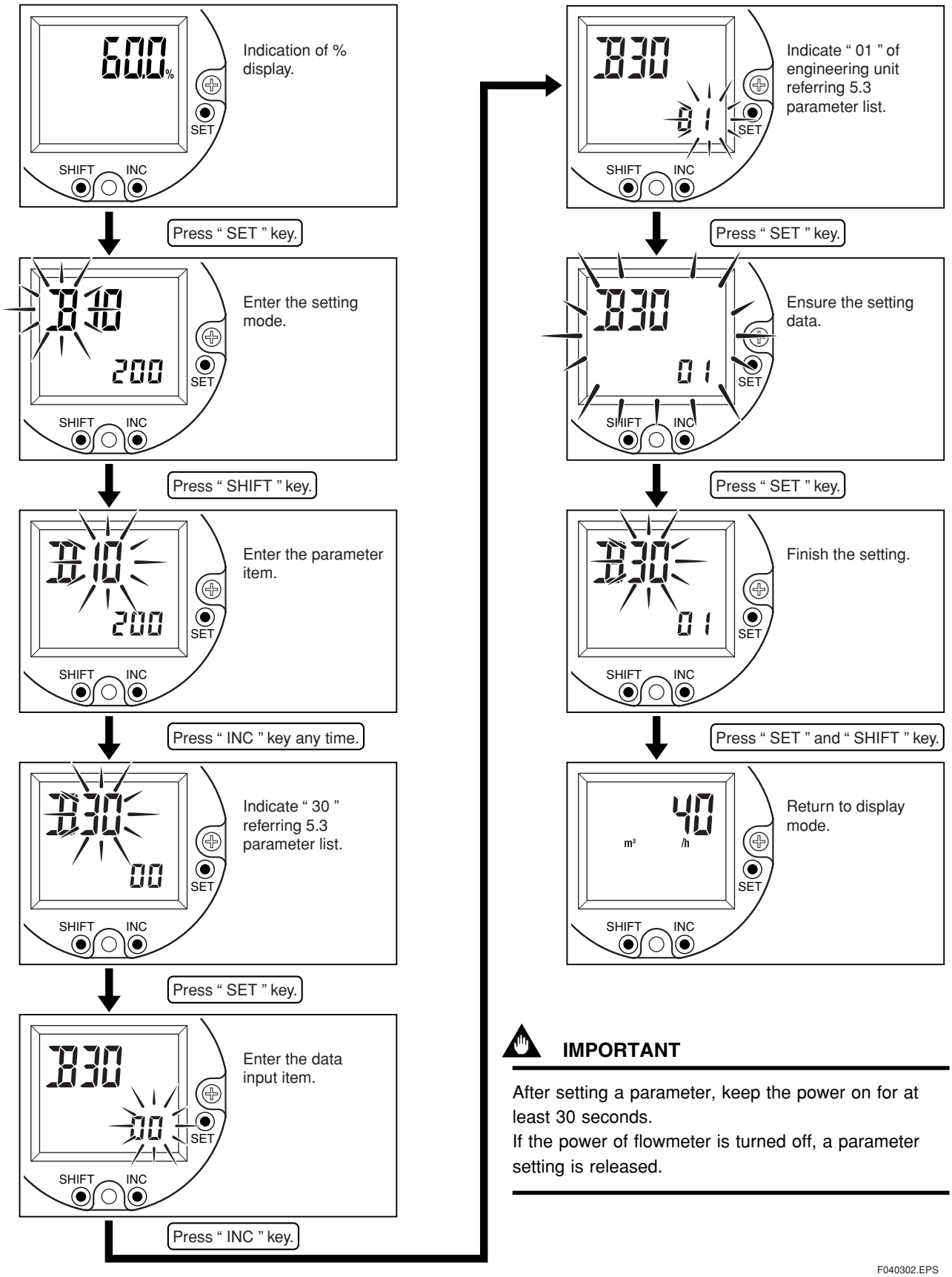
- For operation using BT200, perform changes using the parameter item " B30:UPPER DISP" and "B31:LOWER DISP" referring to section 5. Parameters.
- For operation using indicator, change B30 and B31 parameter item number to display an appropriate display.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.3.1 Change the Display Mode from % Display to Engineering Unit

The display mode can be changed referring 5.3 parameter list.



IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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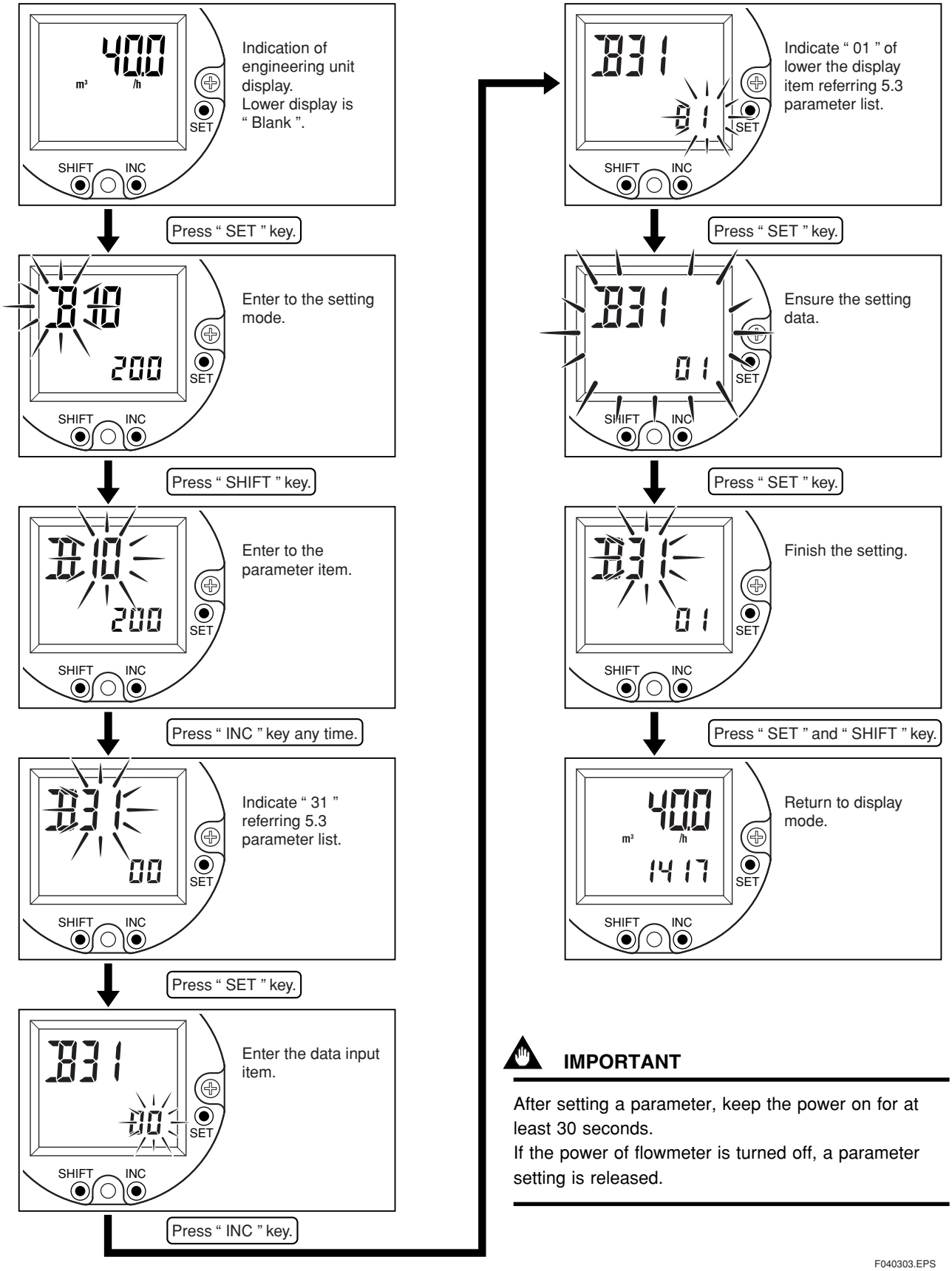
4.3.2 Indicate the Total Rate in the Lower Display

The display mode can be changed referring 5.3 parameter list.


40.0
m³
/h
SET
SHIFT
INC
Indication of engineering unit display. Lower display is " Blank ".
Press " SET " key.
200
Enter to the setting mode.
Press " SHIFT " key.
Enter to the parameter item.
Press " INC " key any time.
00
Indicate " 31 " referring 5.3 parameter list.
Press " SET " key.
Enter the data input item.
Press " INC " key.
01
Indicate " 01 " of lower the display item referring 5.3 parameter list.
Press " SET " key.
Ensure the setting data.
Press " SET " key.
Finish the setting.
Press " SET " and " SHIFT " key.
1417
Return to display mode.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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4.4 Setting Mode

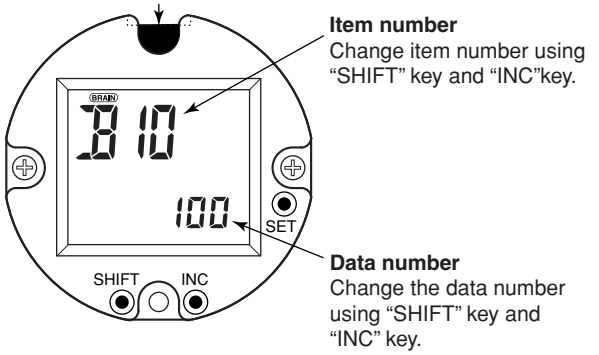
The setting mode is used for checking parameters and rewriting data. The following is an overview of the setting mode.

NOTE

- Refer to 5.3 Parameter List and 5.4 Parameter description for information on how to change setting.

4.4.1 Structure of Setting Mode Display

Simple parameter sheet
IN this sheet, a setting flow chart and the parameter list required to operate digitalYEWFLO is indicated.



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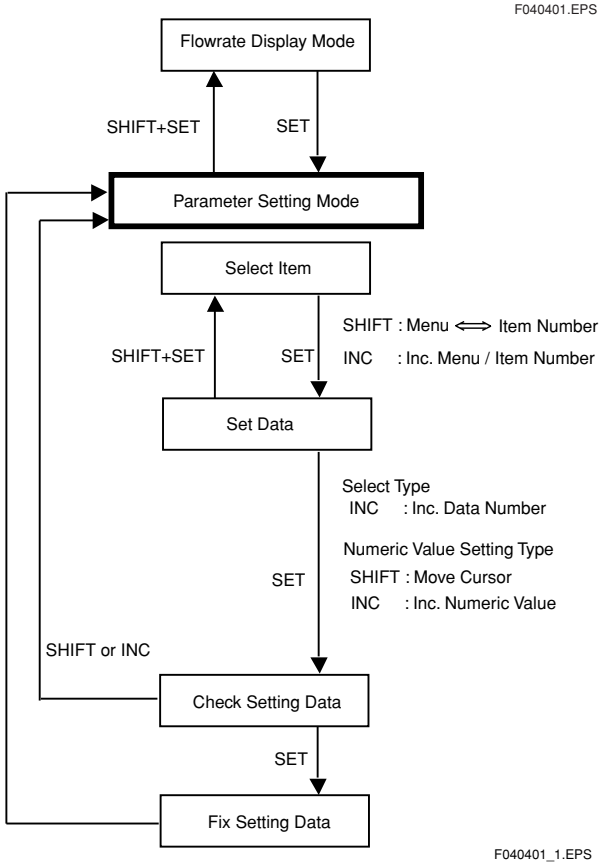

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Figure 4.3 Indicator Construction and Parameter Setting Procedure

- When completing setting, press "SHIFT" key and "SET" key simultaneously. The mode move to the "display mode".

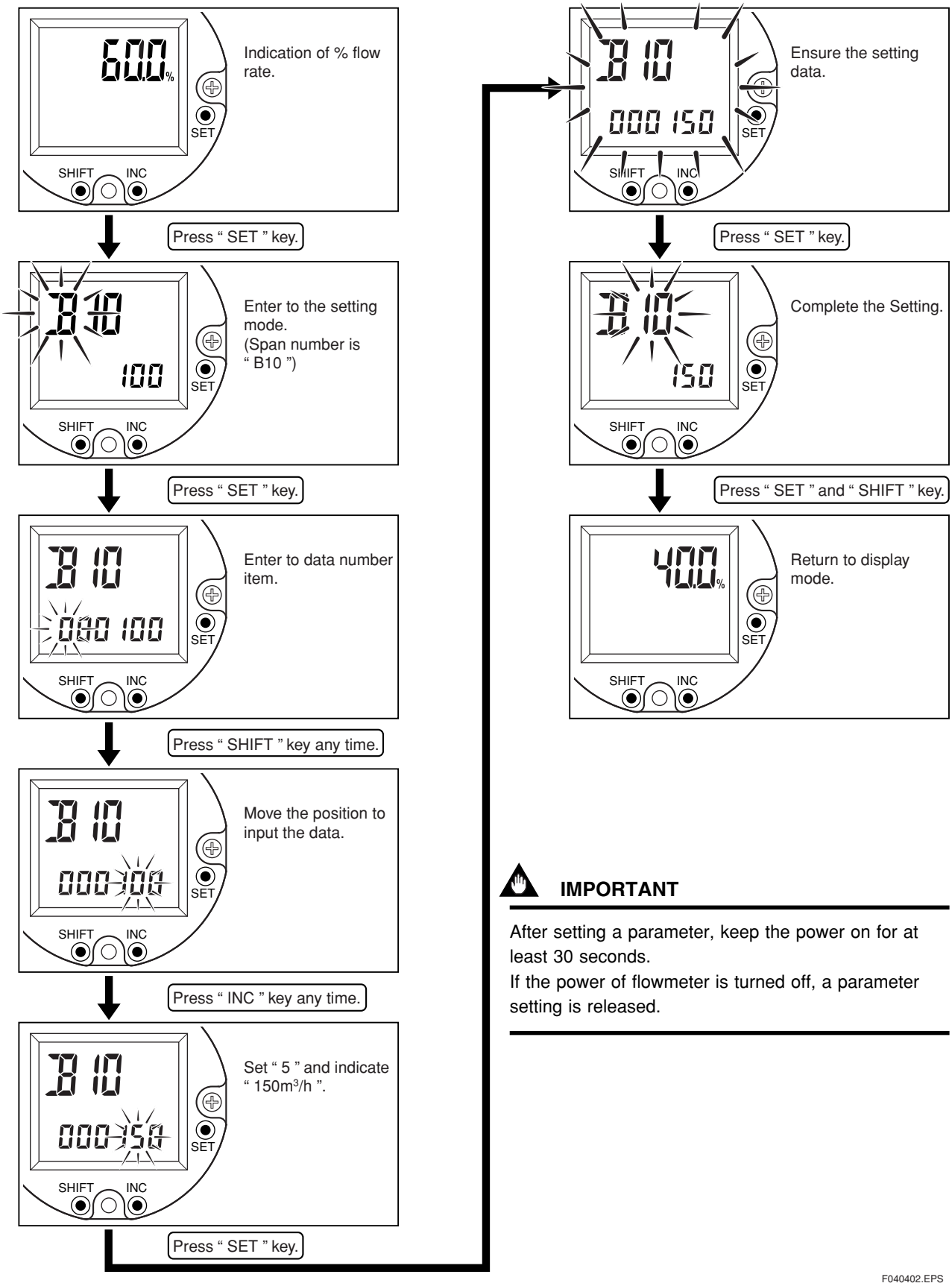
IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

4.4.2 Method of Parameter Setting

■ Input method of numeric data

Example 1: Change the span from 100m³/h to 150m³/h
The setting mode can be changed referring 5.3 parameter list



IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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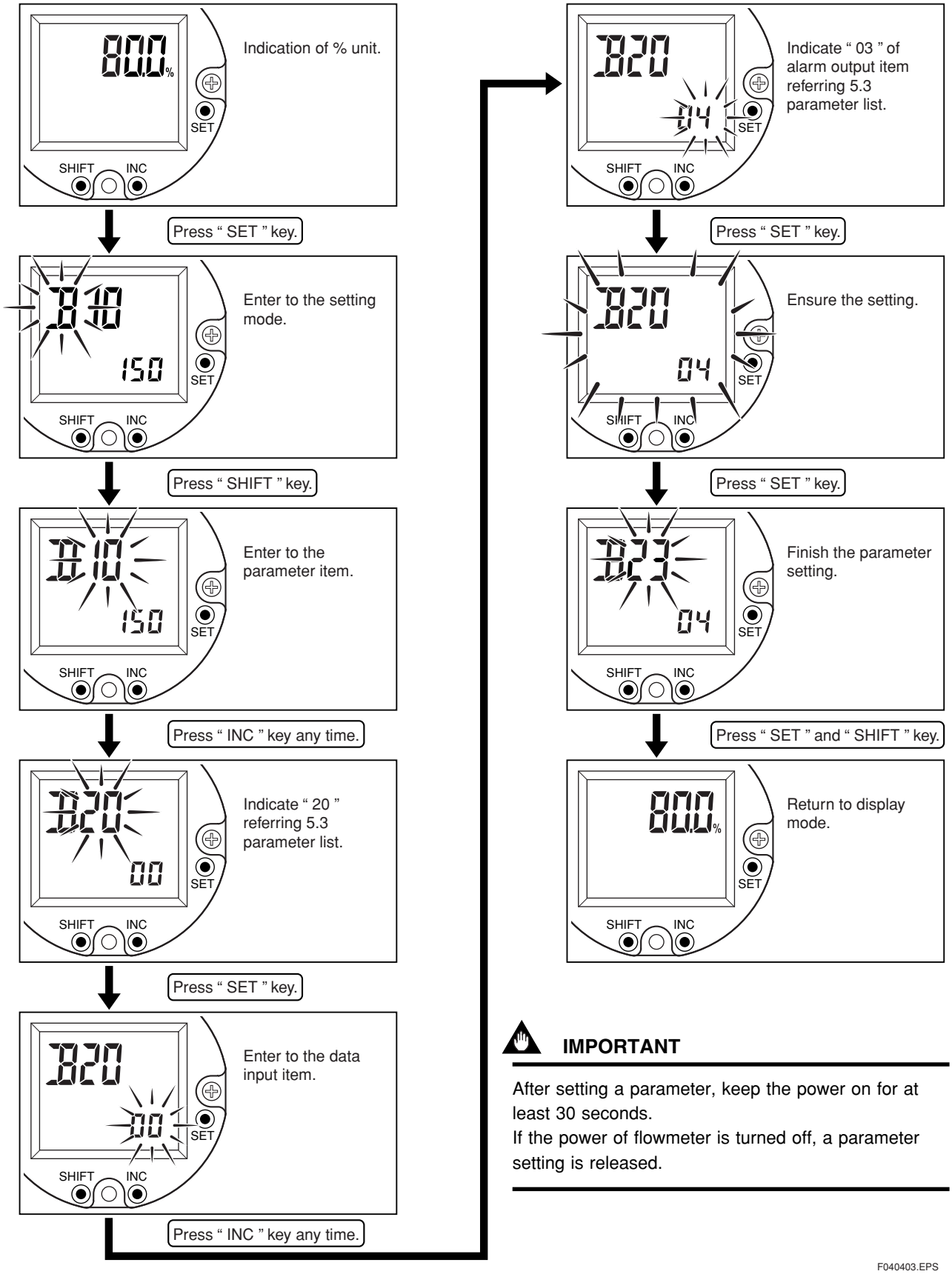
■ Input method of selection items

Example 2: Change the pulse output to alarm output.
The setting mode can be changed referring 5.3 parameter list


Indication of % unit.
SET
SHIFT
INC
Press " SET " key.
Enter to the setting mode.
150
Press " SHIFT " key.
Enter to the parameter item.
Press " INC " key any time.
Indicate " 20 " referring 5.3 parameter list.
00
Press " SET " key.
Enter to the data input item.
Press " INC " key any time.
Indicate " 03 " of alarm output item referring 5.3 parameter list.
04
Press " SET " key.
Ensure the setting.
Press " SET " key.
Finish the parameter setting.
Press " SET " and " SHIFT " key.
Return to display mode.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

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5. PARAMETER SETUP

5.1 Parameter Setup

The parameters are set before factory shipment. Set the required parameter of changing fluid, contact out and indication of display.

5.2 Multi-Variable Type Parameter (Only for /MV)

Parameter item F is indicated when /MV is selected.

The parameters are set before factory shipment, but it is necessary to set the analog output of temperature, span of temperature output.

IMPORTANT

For the remote type, be sure to set the cable length (F52) for DYA, remote type converter, because of effect of the cable length.

5.3 Parameters List

This section describes the parameter of digitalYEWFLO.

• Contents of parameter lists.

Item	Description
Parameter number	Parameter item number.
Name	Parameter name.
R / W (Read and write)	Indicates parameter attributes. R : Display only (writing is not permitted). W : Writing is permitted.
Data range	Shows data setting ranges for numerical value entry. Shows data to be selected for data selection. ( ) in parentheses, data code is shown for the display.
Unit	Engineering unit.
Remarks	Remarks such as a description of the contents are given.
Disp.	D : Display can set parameter.
U / D	L : Parameter can be set by UP LOAD and DOWN LOAD. (Check all parameters after setting by DOWN LOAD.)
Initial value	Indicates the initial set values.

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(1) Item A : Indication

These items are for the indication of flowrate and total.

Item	Name	R / W	Data Range	Unit	Decimal point	Remark	Initial value	Disp.	U / D
A00	DISPLAY					Menu A (Display)			
A10	FLOW RATE(%)	R	0.0 to 110.0	%	1	Flow rate			
A20	FLOW RATE	R	0.0 to 65535	FU+C40	0 to 5	Flow rate (in engineering unit)			
A30	TOTAL	R	0 to 999999	FU	0 to 5	Totalized value			
	(Indicate only within Temperature sensor)								
A40	TEMP(%)(*1)	R	0.0 to 110.0	%	1	Temperature Values (%)			
	(Indicate only for Temperature sensor)								
A41	TEMPERATURE(*1)	R	–999.9 to 999.9	D20	1	Temperature Values			
A60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			

FU : Flow unit
(*1): Only for Option Code /MV

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(2) Item B : Easy Setting

These items are for the principal items to operate digitalYEWFLO.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R / W	Data Range	Unit	Decimal point	Remark	Initial value	Disp.	U / D
B00	EASY SETUP					Menu B			
B10	FLOW SPAN	W	0.00001 to 32000	FU+C40	0 to 5	Flow Span	10	D	L
B15	DAMPING	W	0 to 99	sec	0	Damping Time	4	D	L
B20	CONTACT OUT	W	OFF (0) SCALED PULSE (1) UNSCALED PULSE (2) FREQUENCY (3) ALARM (4) FLOW SW(LOW:ON) (5) FLOW SW(LOW:OFF) (6)			Contact Output Type	(0)	D	L
	(Indicate and Set only for B20 : SCALED PULSE, UNSCALED PULSE)								
B21	PULSE RATE	W	0.00001 to 32000	FU / P	0 to 5	Pulse Output Rate	1.0	D	L
	(Indicate and Set only for B20 :FREQUENCY)								
B22	FREQ AT 100%	W	0 to 10000	PPS	0	Pulse Output Rate at sec / 100%	1000	D	L
	(Indicate and Set only for B20 :FLOW SW (ON), FLOW SW (OFF))								
B23	SET LEVEL	W	0.00001 to 32000	FU +C40	0 to 5	Flow Switch (Actual Flow rate)	0	D	L
B30	UPPER DISP	W	FLOW RATE (%) (0) FLOW RATE (1) TEMP(%)(*1)			Selection of Upper Display	(0)	D	L
B31	LOWER DISP	W	BLANK (0) TOTAL (1) TEMP(*1)			Selection of Lower Display	(0)	D	L
B40	TOTAL START	W	STOP (0) START (1)			Start / Stop of Totalizer	(0)	D	L
B45	TOTAL RATE	W	0.00001 to 32000 (0)	FU / P	0 to 5	Total Rate	1.0	D	L
B47	TOTAL RESET	W	NOT EXECUTE (0) EXECUTE (1)			Totalizer Reset	(0)	D	L
	(Indicate and Set only for Option code /MV)								
B50	A / OUT SELECT	W	FLOW (0) TEMP (1)			Selection of Analog Output	(0)	D	L
	(Indicate and Set only for B50: TEMP)								
B51	TEMP 0%	W	-999.9 to 999.9	D20	1	Set Temperature Value at 0%	-40	D	L
B52	TEMP 100%	W	-999.9 to 999.9	D20	1	Set Temperature Value at 100%	250	D	L
B60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			

FU : Flow unit
(*1) : Only for Option Code /MV

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(3) Item C : BASIC SETUP

These items are for the basic parameters with setting before shipment.
The parameters, C20 to C50, are not indicated when option code "/MV" is selected and parameter item is selected in F10 except "Monitor only" or "Not use".

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Decimal point	Remark	Initial value	Disp.	U/D
C00	BASIC SETUP					Menu C (Meter characterize)			
C10	TAG NO.	W	16 characters			Tag Number			
C20	FLUID	W	LIQUID:Volume (0)			Selection of FLUID type	(0)	D	L
			GAS/STEAM:Volume (1)						
			LIQUID:Mass (2)						
			GAS/STEAM:Mass (3)						
			GAS:STD/Normal (4)						
(Indicate and Set only for C20 : LIQUID : Volume, GAS / STEAM : Volume)									
C22	VOLUME UNIT	W	m^3 (0)			Selection of Flow Units for Flow Rate	(0)	D	L
			k m^3 (1)						
			l (2)						
			cf (3)						
			m cf (4)						
			k cf (5)						
			USgal (6)						
			k USgal (7)						
			UKgal (8)						
			k UKgal (9)						
			bbl (10)						
			m bbl (11)						
			k bbl (12)						
(Indicate and Set only for C20 : LIQUID : MASS, GAS / STEAM : MASS)									
C25	DENSITY UNIT	W	kg/m^3 (0)			Selection of Density Unit	(0)	D	L
			lb/cf (1)						
			lb/USgal (2)						
			lb/UKgal (3)						
C26	DENSITY f	W	0.00001 to 32000	C25	0 to 5	Operating Density (Manual Setting Value)	1024	D	L
C27	MASS UNIT	W	kg (0)			Selection of Mass Flow Unit	(0)	D	L
			t (1)						
			lb (2)						
			k lb (3)						
(Indicate and Set only for C20 : GAS : STD / Normal)									
C30	TEMP UNIT	W	deg C (0)			Selection of Temperature Unit	(0)	D	L
			deg F (1)						
C31	TEMP f	W	-999.9 to 999.9	C30	1	Operating Temperature (Manual Setting Value)	15.0	D	L
C32	TEMP b	W	-999.9 to 999.9	C30	1	Standard / Normal Temperature	15.0	D	L
C33	PRESS UNIT	W	MPa abs (0)			Selection of Pressure Unit	(0)	D	L
			kPa abs (1)						
			bar abs (2)						
			kg/cm^2 a (3)						
			psia (4)						
C34	PRESS f	W	0.00001 to 32000	C33	0 to 5	Absolute Pressure at Operating Condition (Manual Setting Value)	0.1013	D	L
C35	PRESS b	W	0.00001 to 32000	C33	0 to 5	Absolute Pressure at Standard Condition	0.1013	D	L
C36	DEVIATION	W	0.001 to 10.0		3	Deviation Factor	1.0	D	L
C37	STD/NOR UNIT	W	Nm^3 (0)			Selection of Volumetric Unit at Normal Condition N: Normal S: Standard	(0)	D	L
			k Nm^3 (1)						
			M Nm^3 (2)						
			Nl (3)						
			Sm^3 (4)						
			k Sm^3 (5)						
			M Sm^3 (6)						
			Sl (7)						
			scf (8)						
			k scf (9)						
			M scf (10)						
C40	TIME UNIT	W	/s (0)			Selection of Time Unit	(2)	D	L
			/m (1)						
			/h (2)						
			/d (3)						
C45	FLOW SPAN	W	0.00001 to 32000	FU+C40	0 to 5	Flow Span	10	D	L
C50	DAMPING	W	0 to 99	sec	0	Damping Time	4	D	L
C60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			

FU : Flow unit
(*1) : Only for Option Code /MV

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(4) Item D : Additional Setup

These items are for Auxiliary Setup.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Decimal point	Remark	Initial value	Disp.	U/D
D00	AUX. SETUP					Menu D (Additinal Setup)			
D10	LOW CUT	W	* to 32000	FU+C40	0 to 5	Low Cut Flow rate *Minimum Flow rate / 2	0.47	D	
D20	TEMP UNIT	W	deg C (0) deg F (1)			Selection of Temperature Unit	(0)	D	L
D21	TEMP f	W	-999.9 to 999.9	D20	1	Operating Temperature (Manual Setting Value)	15.0	D	L
D25	DENSITY UNIT	W	kg/m^3 (0) lb/cf (1) lb/USgal (2) lb/UKgal (3)			Selection of Density Unit	(0)	D	L
D26	DENSITY f	W	0.00001 to 32000	D25	0 to 5	Operating Density (Manual Setting Value)	1024	D	L
D30	OUT LIMIT (H)	W	100.0 to 110.0	%	1	Upper Limit Value	110.0	D	L
D35	BURN OUT	R	High (0) Low (1)			Output Direction at Burn Out	(0)	D	L
D40	SPECIAL UNIT		No (0) Yes (1) Special (2)			Selection of change for Special Flow Unit	(0)	D	L
(Indication and set only for D40 : Yes)									
D41	BASE UNIT	R	m^3 (0) k m^3 (1) l (2) cf (3) m cf (4) k cf (5) USgal (6) kUSgal (7) UKgal (8) kUKgal (9) bbl (10) m bbl (11) k bbl (12) kg (13) t (14) lb (15) k lb (16) Nm^3 (17) k Nm^3 (18) M Nm^3 (19) Nl (20) Sm^3 (21) k Sm^3 (22) M Sm^3 (23) Sl (24) scf (25) k scf (26) M scf (27)			Basic unit for conversion to special unit N: Normal S: Standard		D	
D42	USER'S UNIT	W	8 characters			User's unit			L
D43	CONV FACTOR	W	0.00001 to 32000		0 to 5	Conversion factor	1.0	D	
D60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			L

FU : Flow unit

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(5) Item E : Detector Setup

These items are for detector that has been already set before.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R / W	Data Range	Unit	Decimal point	Remark	Initial value	Disp.	U / D
E00	METER SETUP					Menu E (Detector setup)			
E10	NOMINAL SIZE	W	15mm (0) 25mm (1) 40mm (2) 50mm (3) 80mm (4) 100mm (5) 150mm (6) 200mm (7) 250mm (8) 300mm (9) —— (10)			Selection of Nominal Size	(1)	D	L
E20	BODY TYPE	W	Standard (0) High Pressure (1) Low Flow Unit (1) (2) Low Flow Unit (2) (3)			Selection of Body Type	(0)	D	L
E30	SENSOR TYPE	W	Standard (0) High Temperature (1) Low Temperature (2)			Selection of Sensor Type	(0)	D	L
E40	K-FACT UNIT	W	P/l (0) P/USgal (1) P/UKgal (2)			Selection of K-factor Unit	(0)	D	L
E41	K-FACTOR	W	0.00001 to 32000	E40	0 to 5	K-factor value of 15 deg C	68.6	D	
E50	DETECTOR No.	W	16 characters			Detector number			
E60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			

FU : Flow unit

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(6) Item F: Thermometer (Only for Option Code /MV)

These items is for thermometer setting when.

A Value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Decimal Point	Remark	Initial Value	Disp	U/D*1
F00	THERMOMETER					Menu F (Thermometer function)			
F10	Function	W	Monitor only (0)			Select thermometer function.	(0)	D	L
			Saturated Steam (1)			(Move to F40 when "Monitor only" is selected)			
			Superheat Steam (2)			(Move to F60 when "Not Use" is selected)			
			GAS: STD/Normal (3)						
			LIQUID: Mass (4)						
			Not use (5)						
	(Indicate and set only for F10: Saturated Stem)								
F12	MASS UNIT	W	kg (0)			Selection of mass flow rate unit	(0)	D	L
			t (1)						
			lb (2)						
			k lb (3)						
	(Indicate and set only for F10: Superheat Steam)								
F14	PRSS UNIT	W	MPa abs (0)			Selection of pressure unit	(0)	D	L
			kPa abs (1)						
			bar abs (2)						
			kg/cm2 a (3)						
			psia (4)						
F15	PRESS f	W	0.00001 to 32000	F14	0 to 5	Absolute pressure at operating condition(Manual setting vaiue)	0.1013		
F16	MASS UNIT	W	kg (0)			Selection of mass flow rate unit	(0)	D	L
			t (1)						
			lb (2)						
			k lb (3)						
	(Indicate and set only for F10: GAS STD/Normal)								
F18	TEMP UNIT	W	deg C (0)			Selection of temperature unit	(0)	D	L
			deg F (1)						
F19	TEMP b	W	-999.9 to 999.9	F18	1	Standard/Normal temperature	15.0	D	L
F20	PRESS UNIT	W	MPa abs (0)			Selection of temperture unit	(0)	D	L
		W	kPa abs (1)						
		W	bar abs (2)						
		W	kg/cm2 a (3)						
		W	psia (4)						
F21	PRESS f	W	0.00001 to 32000	F20	0 to 5	Absolute pressure at operating condition(Manual setting value)	0.1013	D	L
F22	PRESS b	W	0.00001 to 32000	F20	0 to 5	Absolute pressure at Standard condition	0.1013	D	L
F23	DEVIATION	W	0.001 to 10.000		3	Deviation factor	1.0	D	L
F24	STD/NOR UNIT	W	Nm3 (0)			Selection of volumetric unit at normal condition	(0)	D	L
			k Nm3 (1)			N: Normal			
			M Nm3 (2)			S: Standard			
			Nl (3)						
			Sm3 (4)						
			k Sm3 (5)						
			M Sm3 (6)						
			Sl (7)						
			scf (8)						
			k scf (9)						
			M scf (10)						
	(Indicate and set only for F10: Liquid: Mass)								
F26	DENSITY UNIT	W	kg/m3 (0)			Selection of density unit	(0)	D	L
			lb/cf (1)						
			lb/USgal (2)						
			lb/UKgal (3)						
F27	DENSITY b	W	0.00001 to 32000	F26	0 to 5	Density of standard condition	1024	D	L
F28	TEMP UNIT	W	deg C (0)			Selection of temperature unit	(0)	D	L
			deg F (1)						
F29	TEMP b	W	-999.9 to 999.9	F28	1	Temperature of standard condition	15.0	D	L
F30	1st coef	W	-32000 to 32000	1/F28	0 to 5	1st temperature coefficient	0	D	L
F31	2nd coef	W	-32000 to 32000	$1/F28^2$	0 to 5	2nd temperature coefficient	0	D	L
F32	MASS UNIT	W	kg (0)			Selection of mass flow rate unit	(0)	D	L
			t (1)						
			lb (2)						
			k lb (3)						
F35	TIME UNIT	W	/s (0)			Selection of time unit	1	D	L
			/m (1)						
			/h (2)						
			/d (3)						
F40	FLOW SPAN	W	0.00001 to 32000	FU+35	0 to 5	Flow span	0.5	D	L
F45	DAMPING	W	0 to 99	sec	0	Damping	4	D	L
F50	TEMP DAMPING	W	0 to 99	sec	0	Damping for temperture output	4	D	L
F52	CABLE LENGTH	W	0 to 30	m	0	Cable length for signal cable (0m in case of integral version)	0	D	L
F55	A/OUT SELECT	W	FLOW (0)			Selection of analog output	(0)	D	L
			TEMP (1)						
	(Indicate and set only for F55: TEMP)								
F56	TEMP 0%	W	-999.9 to 999.9	D20	1	Temperture value at 0%	-40	D	L
F57	TEMP 100%	W	-999.9 to 999.9	D20	1	Temperture value at 100%	250	D	L
F58	TEMP ERR OUT	W	0% (0)			Selection of themometer error output when "F55: TEMP"	1	D	L
			OUT LIMIT(H) (1)			is selected (A value of OUT LIMIT(H) depend on D30)			
			TEMP f (2)						
F60	SELF CHECK	R	GOOD			Self-diagnostic message			
			ERROR						

(*1) Available for 3.10 or greater version that can be checked in K50 SOFTWARE REV.

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(7) Item H : Adjust.

These items are for setting of adjustment.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Decimal Point	Remark	Initial value	Disp.	U/D
H00	ADJUST					Menu H (Adjust)			
H10	TRIM 4mA	W	-1.00 to 1.00	%	2	Trimming 4mA	0.0	D	
H11	TRIM 20mA	W	-1.00 to 1.00	%	2	Trimming 20mA	0.0	D	
H20	USER ADJUST	W	0.00001 to 32000		0 to 5	User Adjust	1.0	D	
H25	REYNOLDS ADJ	W	NOT ACTIVE (0) ACTIVE (1)			Reynolds Coefficient	(0)	D	
(Indicator and Set only H25 : Active)									
H26	DENSITY f	W	0.00001 to 32000	D25	0 to 5	Density at operating condition	1024	D	
H27	VISCOSITY	W	0.00001 to 32000	mPa·s	0 to 5	Viscosity factor	1.0	D	
H30	EXPANSION FA	W	NOT ACTIVE (0) ACTIVE (1)			Expansion correction for compressible Gas	(0)	D	
H40	FLOW ADJUST	W	NOT ACTIVE (0) ACTIVE (1)			Instrumental Error Adjust	(0)	D	
(Indicator and Set only H40 : Active)									
H41	FREQUENCY 1	W	0 to 32000	Hz	0 to 5	First break-point frequency (f1)	0.0	D	
H42	DATA 1	W	-50.00 to 50.00	%	2	First correcting value (d1)	0.0	D	
H43	FREQUENCY 2	W	0 to 32000	Hz	0 to 5	Second break-point frequency (f2)	0.0	D	
H44	DATA 2	W	-50.00 to 50.00	%	2	Second correcting value (d2)	0.0	D	
H45	FREQUENCY 3	W	0 to 32000	Hz	0 to 5	Third break-point frequency (f3)	0.0	D	
H46	DATA 3	W	-50.00 to 50.00	%	2	Third correcting value (d3)	0.0	D	
H47	FREQUENCY 4	W	0 to 32000	Hz	0 to 5	Fourth break-point frequency (f4)	0.0	D	
H48	DATA 4	W	-50.00 to 50.00	%	2	Fourth correcting value (d4)	0.0	D	
H49	FREQUENCY 5	W	0 to 32000	Hz	0 to 5	Fifth break-point frequency (f5)	0.0	D	
H50	DATA 5	W	-50.00 to 50.00	%	2	Fifth correcting value (d5)	0.0	D	
H60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			

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(8) Item J : Test

These items are for test of output.

A value in "( )" is the data corresponding to the indicator.

Item	Name	R/W	Data Range	Unit	Decimal Point	Remark	Initial value	Disp.	U/D
J00	TEST					Menu J (Test)			
J10	OUT ANALOG	W	0.0 to 110.0	%	1	Current Output	0.0	D	
J20	OUT PULSE	W	0 to 10000	PPS	0	Pulse Output	0	D	
J30	OUT STATUS	W	OFF (0) ON (1)			Status Output	(0)	D	
J40 (*1)	RELEASE TIME	W	10min (0) 30min (1) 60min (2) 3h (3) 6h (4) 12h (5)			Test auto release time	0	D	
J60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			

(*1) Available for 7.00 or greater version that can be checked in K50 SOFTWARE REV.

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(9) Item K : Maintenance

These items are for maintenance.

Item	Name	R/W	Data Range	Unit	Decimal Point	Remark	Initial value	Disp.	U/D
K00	MAINTENANCE					Menu K (Maintenance)			
K10	TLA	W	0.1 to 20.0		1	Trigger Level Adjust	1.0	D	
K20	SIGNAL LEVEL	W	0.1 to 20.0		1	Signal Level	1.0	D	
K25	N.B. MODE	W	AUTO (0) MANUAL (1) TUNING AT ZERO (2)			Selection of Noise balance Mode	(0)	D	
K26	NOISE RATIO	R/W	0.00 to 2.00		2			D	
K28	SET VORTEX F	W	0 to 10000	Hz	0 to 5	Output test by setting simulated frequency.(*2)		D	
K30	VELOCITY	R		m/s	2	Velocity		D	
K32	SPAN V	R		m/s	2	Span velocity		D	
K34	VORTEX FREQ.	R		Hz	0 to 5	Vortex frequency		D	
K36	SPAN F	R		Hz	0 to 5	Span frequency		D	
	(Indicate only for F10: “Saturated Steam” or “Super heat steam” or “Liquid mass)(*1)								
K38	DENSITY	R	0.00001 to 32000	D25	0 to 5	Density value (Calculated by Thermometer)		D	
K40	ERROR RECORD	R				Error Records			
K45	H VIBRATION	W	0% (0) NO ACTION (1)			Selection of Output Function when “High Vibration” error is indicated.	(1)		
K50	SOFTWARE REV	R	0.01 to 99.99			Software Revision Number			
K60	SELF CHECK	R	GOOD ERROR			Self-diagnostic message			

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(*1) Only for Option Code /MV

(*2) Available for 5.10 or greater version that can be checked in K50 SOFTWARE REV.

(10) Item M : Memo

These items are for Memorandum.

Item	Name	R/W	Data Range	Unit	Decimal Point	Remark	Initial value	Disp.	U/D
M00	MEMO					Menu M (Memo)			
M10	MEMO 1	W	16 characters	W		Memorandum 1 (16 characters) (*3)			
M20	MEMO 2	W	16 characters	W		Memorandum 2 (16 characters) (*3)			
M30	MEMO 3	W	16 characters	W		Memorandum 3 (16 characters) (*3)			
M60	SELF CHECK	R	GOOD ERROR	R		Self-diagnostic message			

(*3) The character and sign which can be set up are the same as C10.

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5.4 Parameter Description

(1) Item A : Display

These items are for the indication of flowrate and total.

[A10:FLOW RATE(%)] Flow rate

Flowrate is displayed by "%" to span value.

[A20:FLOW RATE] Flow rate (Engineering unit)

Flowrate is displayed by engineering unit.

[A30:TOTAL] Total value

Total value of flowrate is displayed

The following item should be done in case of which Option code /MV is selected and analog output is "Temperature".

[A40:TEMP(%)] Temperature value

The measured temperature value is displayed by "%" to span value of temperature.

The following item should be done in case of which Option code /MV is selected.

[A41:TEMPERATURE] Temperature value

The measured temperature value is displayed by engineering unit.

(2) Item B : Easy Setting

These items are for the Principal items to operate digitalYEWFLO.

A value in "( )" is the data corresponding to indicator.

[B10:FLOW SPAN] Flowrate span

Set the required span with a numerical.

NOTE

The range of measurable flow velocity is as described in Table 12.5.2.

[B15:DAMPING] Damping time constant

Set damping time constant values from 0s to 99sec.

[B20:CONTACT OUT] Contact output

Select contact output.

Item		Description
OFF	(0)	————
SCALED PULSE	(1)	Scaled pulse output: Refer to "B21"
UNSCALED PULSE	(2)	Unscaled pulse output: Refer to "B21"
FREQUENCY	(3)	Frequency output: Refer to "B22"
ALARM	(4)	Alarm output: The status goes from close to open (OFF) during alarming. Refer to 5.5 Error Code Lists.
FLOW SW (LOW:ON)	(5)	Status output: Refer to "B23"
FLOW SW (LOW:OFF)	(6)	Status output: Refer to "B23"

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[B21:PULSE RATE] Pulse output rate

Set output rate in a selection of SCALED PULSE or UNSCALED PULSE.

SCALED PULSE OUTPUT:

When SCALED PULSE is selected in B20, set flowrate per one pulse output. Rate unit is linking to the flow unit.

UNSCALED PULSE OUTPUT:

When UNSCALED PULSE is selected in B20, it outputs the pulse calculated by following formula.

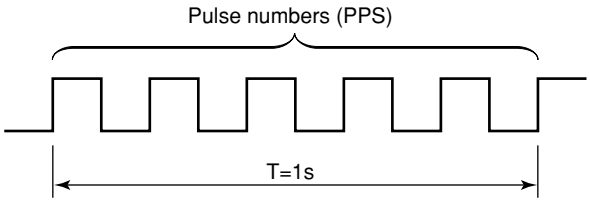
The formula for output pulse number is as follows.

Output pulse number per one second = vortex number per one second / PULSE RATE set number.

Refer to 9.1.5 Unit of Pulse Output (Scaling).

[B22:100% FREQ] Pulse numbers of 100% at one second

Set pulse number at 100% for one second when "FREQUENCY" in B20 is selected.



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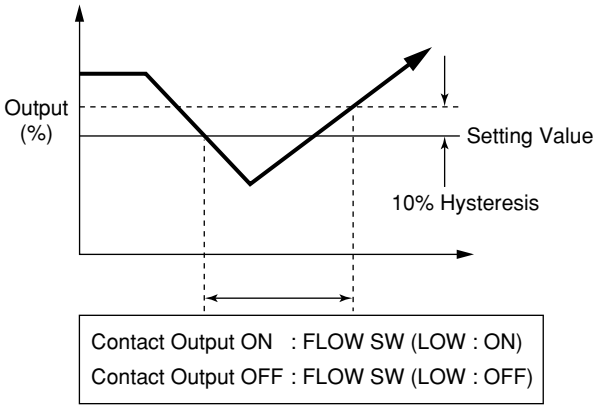
[B23:SET LEVEL] Level of flow switch

Set level of flow switch when "FLOW SW" in B20 is selected. The contact output is sent out when the flowrate is less than the set comparison level.



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[B30:UPPER DISP] Upper indicator display

Select upper display, Flow rate (%) (0), Flowrate (1), TEMP(%)(2). "TEMP(%)" can be selected when Option Code
/MV.

[B31:LOWER DISP] Lower indicator display

Select lower indicator display, "BLANK (0), TOTAL (1), TEMP(2). When "BLANK" in B31 is selected, indicator is blank. "TEMP" can be selected when Option Code
/MV.

[B40:TOTAL START]

Select the START/STOP of totalizer from "STOP (0), START (1)."

[B45:TOTAL RATE] Total rate of the totalizer

Set the total rate of the totalizer.

[B47:TOTAL RESET] Reset the totalizer

When totalizer reset function is executed, the total display and communication parameter are reset.

The following items should be done in case of which Option code "/MV" is selected.

[B50 A/OUT SELECT] Analog Output select

Select the analog output select from flow rate or temperature.

When changing the analog output, UPPER DISPLAY can be changed shown as below automatically.

B50 : A/OUT SELECT	UPPER DISPLAY
"TEMP" TO "FLOW"	FLOW(%)
"FLOW" TO "TEMP"	TEMP(%)

("B30 : UPPER DISPLAY" is "FLOW RATE", it can not be changed.)

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The following item should be done in case of which B50 is "TEMP"

[B51 TEMP 0%]

Set temperature value of 0% output.

[B52 TEMP 100%]

Set temperature valve of 100% output.

(3) Item C : BASIC SETUP

These items are for the basic parameters with setting before shipment.

The parameters which are set in B are not necessary to set in C.

A value in "( )" is the data corresponding to indicator.

The parameters, C20 to C50, are not indicated when option code "/MV" is selected and parameter item is selected in F10 except "Monitor only" or "Not Use".

[C10: TAG NO] Tag. No

Set Tag. No. (16 characters)

Available characters are as follows.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z a b c d e f g h i j k l m n o p q r s t u v w x y z 0 1 2 3 4 5 6 7 8 9 . SPACE / - , + *) (' & % $ # " !

[C20:FLUID] Flowrate unit

Set the flowrate unit below.

Item	Description
LIQUID : Volume (0)	Volumetric flow of liquid measuring
GAS/STEAM : Volume (1)	Volumetric flow of gas or steam measuring
LIQUID : Mass (2)	Mass flow of liquid measuring
GAS/STEAM : Mass (3)	Mass flow of gas or steam measuring
GAS : STD/Normal (4)	Volumetric flow at Standard condition

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The following items should be done in case of which "C20" is "LIQUID : Volume" or "GAS/STEAM : Volume".

[C22:VOLUME UNIT] Volumetric unit

Select the unit of volumetric flow from m^3(0), km^3(1), l(2), cf(3), mcf(4), def(5), USgal(6), kUKgal(9), bbl(10), mbbl(11), kbbl(12).

The following items should be done in case of which "C20" is "LIQUID: Mass" or "GAS/STEAM : Mass"

[C25:DENSITY UNIT] Density Unit of Flow measurement

Select the unit of density from kg/m^3(0), lb(1), lb/USgal(2), lb/UKgal(3).

[C26:DENSITY f] Density at normal operation conditions

Set the density value of the fluid at operating condition for mass flow unit.

[C27:MASS UNIT] Mass flowrate unit

Select the mass flowrate unit from kg(0), t(1), lb(2), k lb(3).

The following item should be done in case of which "C20" is "GAS/STEAM : Volume".

[C30:TEMP UNIT] Fluid temperature unit at operating conditions

Select temperature unit at operating condition from

"degC (0), degF (1)".

[C31:TEMP f] Fluid temperature at operating conditions

Set fluid temperature at operating condition.

Range is -196 to 450°C

The following items should be done in case of which "C20" is "GAS/STD : Normal".

[C32:TEMP b] Fluid temperature at standard/normal conditions

Set the values of Fluid temperature at standard condition.

[C33:PRESS UNIT] Pressure unit

Select the unit of pressure from "MPa abs(0), kPa abs(1), kg/cm2 abs(2), bar abs(3)".

[C34:PRESS f] Absolute pressure at operating conditions

Set the absolute pressure at operating condition.

[C35:PRESS b] Absolute pressure at standard/normal condition

Set the absolute pressure at normal condition.

[C36:DEVIATION] Deviation factor

Set deviation factor.

[C37:STD/NOR UNIT] Volumetric unit at normal conditions

Select volumetric unit at normal condition from Nm^3(0), kNm^3(1), MNm^3(2), Nl(3), Sm^3(4), km^3(5), Mm^3(6), Sl(7), scf(8), kscf(9), Mscf(10).
N: Normal
S: Standard

[C40:TIME UNIT] TIME UNIT

Select time unit from "/s(0), /m(1), /h(2), /d(3)"

[C45:FLOW SPAN] Flowrate span

Set the required span with a numerical value.

[C50:DAMPING] Damping time constant

Set damping time constant values from 0 to 99s.

(4) Item D (AUX SETUP)

These items are for Auxiliary setup.

A value in "( )" is the data corresponding to indicator.

[D10:LOW CUT] Low-cut flowrate

NOTE

For D10 setting, be sure to set "NOMINAL SIZE" in E10 firstly.

Set to noise elimination or zero flow in the low flowrate (or low frequency) range. The settable range for low cut flowrate is more than half-minimum flowrate.

NOTE

In case that Reynolds adjustment (H25), Gas expansion correction (H30) or select a break point correction (H40) is necessary to set, D10: LOW CUT must be set after the items for compensations (H25, H30, H40) are set to "ACTIVE".

[D20:TEMP UNIT] Fluid temperature unit at operating conditions

Select temperature unit at operating condition from "degC (0), degF (1)".

[D21:TEMP f] Fluid temperature at operating conditions

Set fluid temperature at operating condition.

Range is -196 to 450°C

[D25:DENSITY UNIT] Density Unit of Flow measurement

Select the unit of density from kg/m^3(0), lb(1), lb/USgal(2), lb/UKgal(3).

[D26:DENSITY f] Density at normal operation conditions

Set the density value of the fluid at operating condition for mass flow unit

[D30:OUT LIMIT] Limit value of output and indication

Set limit value of output from 100.0% to 110.0%

[D35:BURN OUT] Indication of the output direction at burn out

This is indication of the output direction at burn out. Refer to "9.1.6 Burn out" when the output direction can be changed.

[D40:SPECIAL UNIT] Change to special flowrate unit

No(0) : Off the function

Yes(1) : Convert the flow unit for USER'S UNIT
The factor to convert the flow unit comes from D43. The time unit comes from C40 or F35.

Special(2) : Convert the flow unit and time unit for the USER'S UNIT.
The factor to convert the flow unit and time unit comes from D43.

[D41:BASE UNIT] Indication of the base flowrate unit

Indication of the basic flowrate unit when item D40 is "Yes(1)" or "Special(2)".

[D42:USER'S UNIT] Free unit for users

Set in up to 8 alphanumeric characters when item D40 is "Yes(1)" or "Special(2)".

The character and sign which can be set up are the same as C10.

[D43:CONV FACTOR] Conversion factor

Set the conversion factor when item D40 is "Yes(1)" or "Special(2)".

Set the conversion factor which is for both flow unit and time unit in case of "Special(2)".

(5) Item E (METER SETUP)

These items are for detector set up that has already been set before shipment.

A value in "( )" is the data corresponding to indicator.

[E10:NOMINAL SIZE] Nominal size of the detector

Select the nominal size of the flowmeter, from "15mm(0), 25mm(1), 40mm(2), 50mm(3), 80mm(4), 100mm(5), 150mm(6), 200mm(7), 250mm(8), 300mm(9)"

[E20:BODY TYPE] Body type for the detector

Select body type for detector from standard or high pressure.

Standard	(0) : Standard type
High Pressure	(1) : High Pressure type (tokuchu)
Low Flow Unit (1)	(2) : Reduced Bore type (option : /R1)
Low Flow Unit (2)	(3) : Reduced Bore type (option : /R2)

NOTE

Parameter setting for the Reduced Bore type, Select Low Flow Unit (1) or (2) and set. Set nominal size of the model code to E10: NOMINAL SIZE.

[E30:SENSOR TYPE] Sensor type for the detector

Select sensor type for the detector from standard or HT/LT

[E40:K-FACTOR UNIT],

Select this unit from p/l, p/USgal, p/UKgal.

IMPORTANT

K-FACTOR is the eigenvalue of each detector.
Please keep the factory preset value.
NEVER REWRITE IT.
(Unless the replacement of the remote type detector.)

[E41:K-FACTOR]

The flowmeter data plate includes a K-factor (KM) at 15°C for the combined detector.

[E50:DETECTOR NO.] Detector number of flowmeter

Set the serial number using 16 alphanumeric characters of the detector combined converter.

(6) Item F (Thermometer)

These items are for setting of thermometer and available when build in thermometer type (Option code: /MV).

[F10: Function] Thermometer function

Select the thermometer function.

Monitor only(0): Only temperature measurement.

Saturated Steam: Mass Flow rate is calculated from density values by temperature measurement using saturated steam table.

Superheat Steam: Mass Flow rate is calculated from density values by temperature measured by using steam table. In order to measure superheat steam. It is necessary to make constant pressure value.

GAS: STD/Normal: Volumetric flow rate at standard condition is calculated by using Pressure-Temperature correction. It is necessary to male constant pressure value.

Liquid: Mass: Mass flow rate is calculated by using the density change values depend on temperature values by which the secondary order function is used.

The following item should be done in case of which F10 is Saturated steam

[F12 MASS UNIT] Mass flow unit

Select mass rate unit from kg(0), t(1), lb(2), k lb(3).

The following items should be done in case of which F10 is Superheat steam

[F14 PRESS UNIT] Pressure unit

Select pressure unit from MPa abs(0), kPa abs(1), bar abs(2), kg/cm^2 a(3), psia(4).

[F15 PRESS f] Pressure value

Set absolute pressure values at operating condition.

[F16 MASS UNIT] Mass flow unit

Select mass flow unit from kg(0), t(1), lb(2), k lb(3).

The following items should be done in case of which F10 is GAS: STD/Normal

[F18 TEMP UNIT] Temperature unit

Select temperature unit from deg C(0), deg F (1).

[F19 TEMP b] Temperature b

Set temperature value at normal/standard condition.

[F20 PRESS UNIT] Pressure unit

Select pressure unit from MPa abs(0), kPa abs(1), bar abs(2), kg/cm^2 a(3), psia(4).

[F21 PRESS f] Pressure value f

Set absolute pressure values at operating condition.

[F22 PRESS b] Pressure value b

Set absolute pressure values at normal/standard Condition.

[F23 DAVIATION] Daviation factor

Set the daviation factor.

[F24 STD/NOR UNIT] Standard/Normal unit

Select Volumetric unit at standard/normal condition From Nm3(0), k Nm3(1), M Nm3(2), Nl(3), Sm3(4)

k Sm3(5), M Sm3(6), Sl(7), scf(8), k scf(9), M scf(10)

N: Normal
S: Standard

The following item should be done in case of which F10 is LIQUID:MASS

[F26 DENSITY UNIT] Density unit

Select density unit from kg/m3(0), lb/cf(1), lb/USgal(2), lb/UKgal(3).

[F27 DENSITY b] Density b

Set density value at standard condition.

[F28 TEMP UNIT] Temperature unit

Select temperature unit from deg C(0), deg F(1).

[F29 TEMP b] Temperature b

Set temperature value at standard condition

[F30 1st coef] 1st coefficient

Set lst temperature coefficient using the density correction.

[F31 2nd coef] 2nd coefficient

Set lst temperature coefficient using the density correction.

[F32 MASS UNIT] Mass unit

Select mass flow rate unit from kg(0), t(1), lb(2), k lb(3).

[F35 TIME UNIT] Time unit

Select time unit from /s(0), /m(1), /h(2), /d(3).

[F40 FLOW SPAN] Flow span

Set span flow rate, 0 to 32000.

[F45 DAMPING] Flow damping

Set flow damping, 0 to 99sec.

[F50 TEMP DAMPING] Temperature damping

Set temperature damping, 0 to 99sec.

[F52 CABLE LENGTH] Cable length of signal cable(DYC)

Set cable length(m) of signal cable.

In case of the integral type, cable length is set in 0m.

IMPORTANT

Be sure to set this parameter to correct temperature measurement error, occured by cable length.

[F55 A/OUT SELECT] Analog out select

Select the analog output from FLOW(0), TEMP(1).

The following item should be done in case of which F55 is TEMP

[F56 TEMP 0%] Temperature at 0%

Set temperature value at 0%.

[F57 TEMP 100%] Temperature at 100%

Set temperature value at 100%.

[F58 TEMP ERR OUT] Output selection of thermometer error

Select output function when thermometer error from 0%(0), OUTLIMIT(H)(1), TEMP f.

In case of OUT LIMIT(H), it is based on parameter “D30”

(7) Item H (ADJUST)

This item for setting of adjustment.

[H10, H11:TRIM 4mA, TRIM 20mA] Triming of 4mA and 20mA

Fine tuning adjustment of 4mA and 20mA output.

Fine tuning range is form -1.00% to 1.00%.

[H20:USER ADJUST] Conversion factor for user setting.

Set conversion factor by user.

This conversion factor is converted into measurement flowrate.

[H25:REYNOLDS ADJ] Reynolds adjustment

Select the Reynolds adjustment.

This adjustment should be done in case of their error compensation, because error of vortex flowmeter should be increased when it come to low reynolds numbers.

The following item should be done in case of which “H25” is “ACTIVE”.

[H26:DENSITY f]

Set the density at operating condition.

[H27:VISCOSITY]

Set the value of viscosity at standard conditions.
The values should be used for Reynolds adjustment.
Reynolds number(Re) is calculated as shown in the formula below.

$$Re = 354 \times \frac{Q \times \rho f}{D \times \mu}$$

Q : Volumetric flow (m^3/h)
D : Internal diameter (mm)
ρf : Density at operating condition
μ : Viscosity (m Pa · s (cp))

Flowrate error of vortex flowmeter increases as Reynolds number decrease less than 20000.

By setting H25, H26, H27, it corrects the error.

[H30:EXPANSION FA] Gas expansion correction.

When measuring a compressibility gas by mass flow (Steam M, Gas M) and standard condition (Gas Qn), this expansion factor is useful to correct the deviation from the ideal gas law.

[H40:FLOW ADJUST] Select a break point correction

Select a break point correction for the instrumental error from “NOT ACTIVE(0) OR ACTIVE(1)”.

[H41, H45:FLOW ADJUST] Instrumental Error Correction

■ Correct the instrumental error in flowmeter characteristics using 1 line-segment approximation (with five correction factors).

(1) Flow frequency input at line segments needs to be $f_1 \leq f_2 \leq f_3 \leq f_4 \leq f_5$.
When four correction factors are available, line segments need to be $f_4=f_5$ and $d_4=d_5$.
When three correction factors are available, line segments need to be $f_3=f_4=f_5$ and $d_3=d_4=d_5$.

(2) When a flow input of f_1 or less is present, correct the instrumental error as the corrected value=d_1.

(3) When a flow input of f_5 or more is present, correct the instrumental error as the corrected value=d_5.

(4) Abscissa (f_1 to f_5) : Set the break-point frequencies as parameters.

(5) Ordinate (d_1 to d_5) : Set the corrected value (%) at each break-point as parameters.

$$\text{Set value} = -\frac{Qs-I}{I} \times 100$$

Where
Qs : Correct flowrate determined by a reference apparatus
I : Indication of vortex flowmeter

• Definition of error varies with the type of flowmeter. Be careful of the difference in signs in the error and corrected value.

$$Qf = \frac{f(Hz)}{\text{K-factor}} \times 100$$

holds and the error is included in the K-factor.
Therefore, for the region where the K-factor shift on the positive side, the corrected value is negative.
The corrected value when the calibration fluid of the flowmeter and the fluid to be measured are different must be set as a corrected value obtained by making both abscissas agree with respect to the Reynolds number.

NOTE

In case that Reynolds adjustment (H25), Gas expansion correction (H30) or select a break point correction (H40) is necessary to set, D10: LOW CUT must be set after the items for compensations (H25, H30, H40) are set to “ACTIVE”.

(8) Item J (TEST)

These items are for test of output.

A value in "( )" is the data corresponding to indicator.

The test output by setting in J10, J20 or J30 is automatically released when shifts from these parameter items or as following time goes without access to these parameter items.

"K50: SOFTWARE REV" = "6.20" or smaller: 10 minutes

"K50: SOFTWARE REV" = "7.00" or greater: a value set in J40: RELEASE TIME

[J10:OUT ANALOG] 4 to 20mA Current output.

It tests 4 to 20mA Current output. Electric current of the set value (%) which designates 4 to 20mA as 0 to 100%.

When this test is executed, transistor contact output (Pulse, Alarm, Status) is fixed at ON or OFF (not determined).

[J20:OUT PULSE] Pulse output

It tests Pulse output.

The number of pulses which is set (unit: PPS) is output.

Exiting this parameter item or stopping access after ten minutes which is set in J40, this function will be reset automatically.

When this test is executed, current output is fixed at 0% (4mA).

[J30:OUT STATUS] Status output test

Status output test can be executed (OFF(0) or ON(1)).

When this test is executed, current output is fixed at 0% (4mA).

Exiting this parameter item or stopping access after ten minutes, this function will be reset automatically.

[J40:RELEASE TIME]

Automatic reset time of J10, J20 and J30 can be change.

Select from 10min (0), 30min (1), 60min (2), 3h (3), 6h (4), 12h (5).

(9) Item K (Maintenance)

These items are for maintenance.

A value in "( )" is the data corresponding to indicator.

[K10:TLA] TLA Adjustment

Trigger level (TLA) is adjusted upon shipment. Therefore, TLA adjustment is nonnecessity. But set TLA adjustment below as

- The measurement of Low flow rate area is required.
- Mechanical vibration and impact are applied to digitalYEWFLO and Zero point and low flow rate area is output.

  Note: Refer to "9.2 Adjustment for Manual Mode".

[K20:SIGNAL LEVEL]

Set the signal level.

[K25:N. B. MODE]

Set the Noise Balance Mode from "AUTO(0)" or "MANUAL(1)" or "TUNING AT ZERO(2)"

[K26:N. B.RATIO] The ratio of Noise Balance.

When "NOISE BALANCE MODE (N. B. MODE)" is "AUTO", noise balance value is the indication only.

When N.B. mode is "MANUAL", the noise balance can be adjusted entering the setting values.

Note: Refer to "9.2 Adjustment for Manual Mode".

[K28:SET VORTEX F] Output test by setting simulated frequency.

Amplifier check is executed by simulated frequency input.

Output to be able to check are, analog output, pulse output/ contact output.

Test status also can be seen on display board.

NOTE

- In case of multi-variable type (/MV), output value is calculated by setting density and temperature.
- Available for 5.10 or greater version that can be checked in K50 SOFTWARE REV.

[K30:VELOCITY] Flow velocity

Indication of flow velocity at the operating conditions.

[K32:SPAN V] Flow span velocity

Indication of flow span velocity.

When /MV is selected and "F10 : FUNCTION" is "Saturated Steam" or "Superheat Steam" and "GAS : STD/Normal" or "LIQUID : Mass", the display of span velocity may differ from an actual value.

[K34:VORTEX FREQ.] Vortex frequency.

Indication of vortex frequency at operating conditions.

[K36:SPAN F] Span vortex frequency.

Indication of span vortex frequency.

When /MV is selected and "F10 : FUNCTION" is "Saturated Steam" or "Superheat Steam" and "GAS : STD/Normal" or "LIQUID : Mass", the display of span frequency may differ from an actual value.

[K40:ERROR RECORD] Error record

The error record can be indicated.

- The error is recorded as history.
- The error history is not time-series data.
- The error history can be holded for 30 days.

In order to clear an error record, set the video inverse bar by "< >" and press "ENTER"key twice.

[K50:SOFTWARE REV] Software revision

The software revision can be indicated.

5.5 Error Code Lists

When an ERROR is displayed by SELF CHECK in item A60, B60, C60, D60, E60, or H60, J60, K60, M60, press function key F2 [DIAG] and the error contents are displayed.

The error contents are listed below:

Table 5.1 ERROR Code List

Indication	Diagnostic Message	Error Name	Problem Cause	Current Output		% Output		Pulse Output	Engineering Unit Output	Totalizing Output	Engineering Temp Output	Pulse / Status Output			How to recover
				Select flow rate	Select temperature	Select flow rate	Select temperature					Pulse(*2)	Status(*2)	Alarm(*2)	
Err-01	FLOW OVER OUTPUT	Over range ouput signal	Output signal is 110% or more	Fixed at 110%(*1)	Normal Operation	Fixed at 110%(*1)	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change parameters or over ranged flow input
Err-02	SPAN SET ERROR	Span Setting Error	Span setting parameter is more than 1.5 times of max flow velocity	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change parameters span factor is outside the acceptable limits
Err-06	PULSE OUT ERROR	Pulse output error	Pulse output frequency is more than 10kHz	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Fixed at 10KHz	Normal Operation	Normal Operation	Normal Operation	Fixed at 10kHz			Change parameters (ItemC.ItemE)
Err-07	PULSE SET ERROR	Pulse setting error	Pulse output frequency setting is more than 10kHz	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation			Change parameters (ItemC.ItemE)
CHECK Vibration	Transient noise	Error of Vibration	Transitional disturbance	Hold	Normal Operation	Hold	Normal Operation	Normal Operation	Hold	Normal Operation	Normal Operation	Hold	Hold	OFF(H)	CHECK the vibration
CHECK Vibration	High vibration	Error of Vibration	High vibration	Based on K45	Normal Operation	Based on K45	Normal Operation	Stop Output	Based on K45	Stop the total	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the vibration
CHECK Flow	Fluctuating	Error of Flow	Fluctuating	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the clogging
CHECK Flow	Clogging	Error of Flow	Clogging	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the clogging
Err-10	TEMP OVER OUTPUT	Over range Temp output signal	Temp output signal is 110% or more, and 0% below.	Normal Operation	Fixed at 110% in case of over 110%, and fixed at 0% when in case of less than 0%.(*1)	Normal Operation	Fixed at 110% in case of over 110%, and fixed at 0% when in case of less than 0%.(*1)	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	CHECK the temperature or temperature span
Err-11	OVER TEMP	Error of temperature	Temp value is -50°C below or 300°C over.	Remain in operationat Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operationat Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	Remain in operation at Temp=-50°C or Temp=300°C	OFF(H)	CHECK the temperature
Err-12	TEMP SENSOR FAULT	Error of thermometer	Disconnection or short of thermometer sensor	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	OFF(H)	Change thermometer sensor.
Err-13	TEMP CONV. FAULT	Error of temperature converter	Temperature converter is failed	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	Based on F58	Remain in operation at Manual setting condition	Remain in operation at Manual setting condition	OFF(H)	Change converter case build in temperature sensor.
Err-20	PRE-AMP ERROR	PRE-AMP is failed		Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Normal Operation	Normal Operation	Remain in operation at Manual Setting Temperature Value	Normal Operation	Normal Operation	OFF(H)	Replace the AMP. unit
Err-30	EE PROM ERROR	EEPROM is not functioning correctly		Over 110% or -2.5% below	Over 110% or -2.5% below	Fixed at 0%	Fixed at 0%	Halt	Fixed at 0%	Halt	Fixed at 0%	Stop the Output	OFF(H)	OFF(H)	Replace the AMP. unit
Err-40	FLOW SEBSOR FAULT	Error of Flow sensor	Flow sensor Is fault.	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	Normal Operation	OFF(H)	Change Flow sensor
	CPU FAULT	CPU is failed	All operations are Dead. Display and self. dignostic function is also dead.g	Over 110% or -2.5% below	Over 110% or -2.5% below	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Halt	Replace the AMP. unit

Note. Normal Operation : Operation continues without relation to error occurrence.
Remain in Operation : Calculation continues with relation to error occurrence.

(*1) "110%" is based on "D30 : OUT LIMIT(H)".
(*2) Pulse output : These conditions should be done in case of which B20 is "SCALED PULSE", "UNSCALED PULSE", "FREQUENCY".
Status output : These conditions should be done in case of which B20 is "FLOW SW (LOW :ON)", "FLOW SW (LOW : OFF)".
Alarm output : These conditions should be done in case of which B20 is "Alarm".

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6. Operation for the BRAIN Terminal (BT200)

This section describes the operation procedures using a BRAIN Terminal (BT200). For details on the functions of the digitalYEWFLO, refer to 5.3 Parameter List. And also, see the "Model BT200 BRAIN TERMINAL" Instruction Manual (IM 1C0A11-01E) for more detailed Information.

6.1 Connection Method for the BT200

(1) Connecting the BT200 to a 4 to 20mA DC Transfer Line

The communication signal of the digitalYEWFLO is superimposed onto the 4 to 20mA DC analog signal to be transferred.

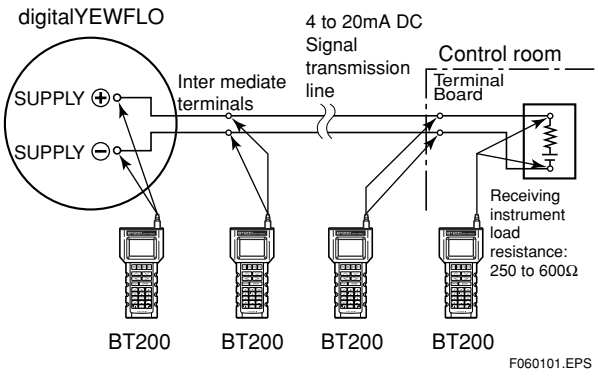


Figure 6.1 Communicating for a 4 to 20mA DC Signal Line

IMPORTANT

The communicable distance of the transmission line is restricted depending on the wiring method. Refer to 3. WIRING.

IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

(2) Connecting BT200 to Flow Converter

Removing a cover and indicator, the terminals for brain communication are provided on the circuit board. Connect BT200 to the terminal of HHT-COM on the circuit board.

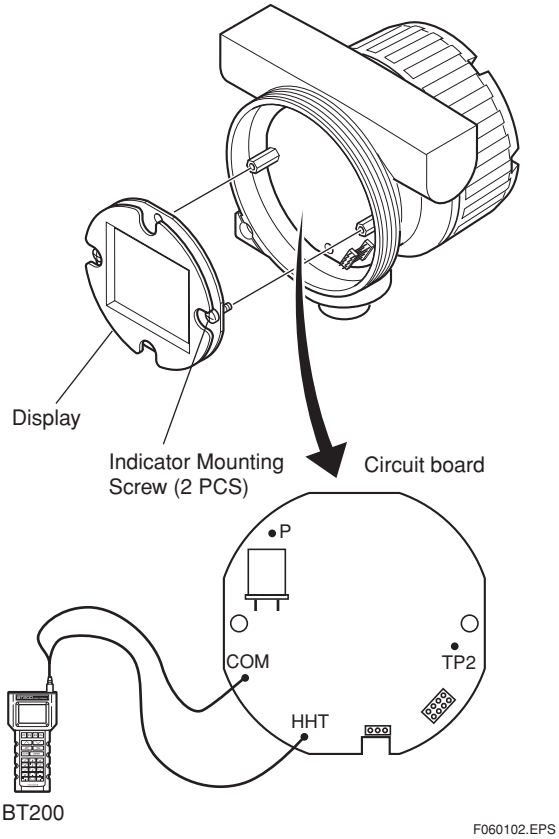
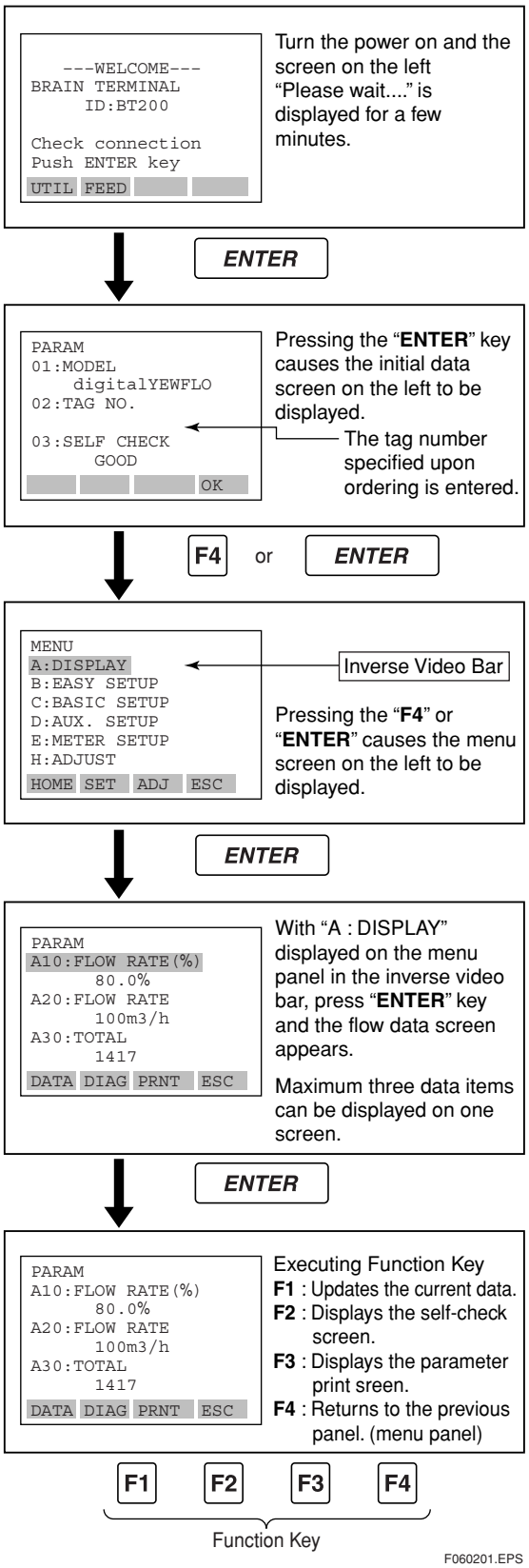


Figure 6.2 Connection of BT200 to Flow Converter

6.2 Displaying Flow Rate Data

Flowrate data can be displayed on the BT200 screen according to the following procedure.



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● Function key

The functions of the function keys vary with the commands being displayed on the display panel.

Table 6.1

Command	Description
ADJ	Calls up the adjustment menu.
CAPS/caps	Changes the uppercase / lowercase mode.
CLR	Clears entered data / deletes all data.
COPY*	Prints parameters on the screen.
DATA	Updates parameter data.
DEL	Deletes one character.
DIAG	Calls up the self-check screen.
ESC	Returns to the preceding screen.
FEED*	Paper feed.
HOME	Calls up the home menu (A : DISPLAY).
LIST*	Prints all parameters of the menus.
NO	Setting stop / re-setting. Returns to the previous screen.
OK	Goes to the next screen.
PARM	Parameter number setting mode.
PON/POFF*	Printer output of data whose setting was changed Mode on / off.
PRNT*	Changes to the prints mode.
SET	Calls up the setting menu (B : SETTING).
SLOT	Returns to the slot selection screen.
GO*	Starts print out.
STOP*	Stops printing.
UTIL	Transfers to the utility screen.

*The command is available only for BT-200-P00

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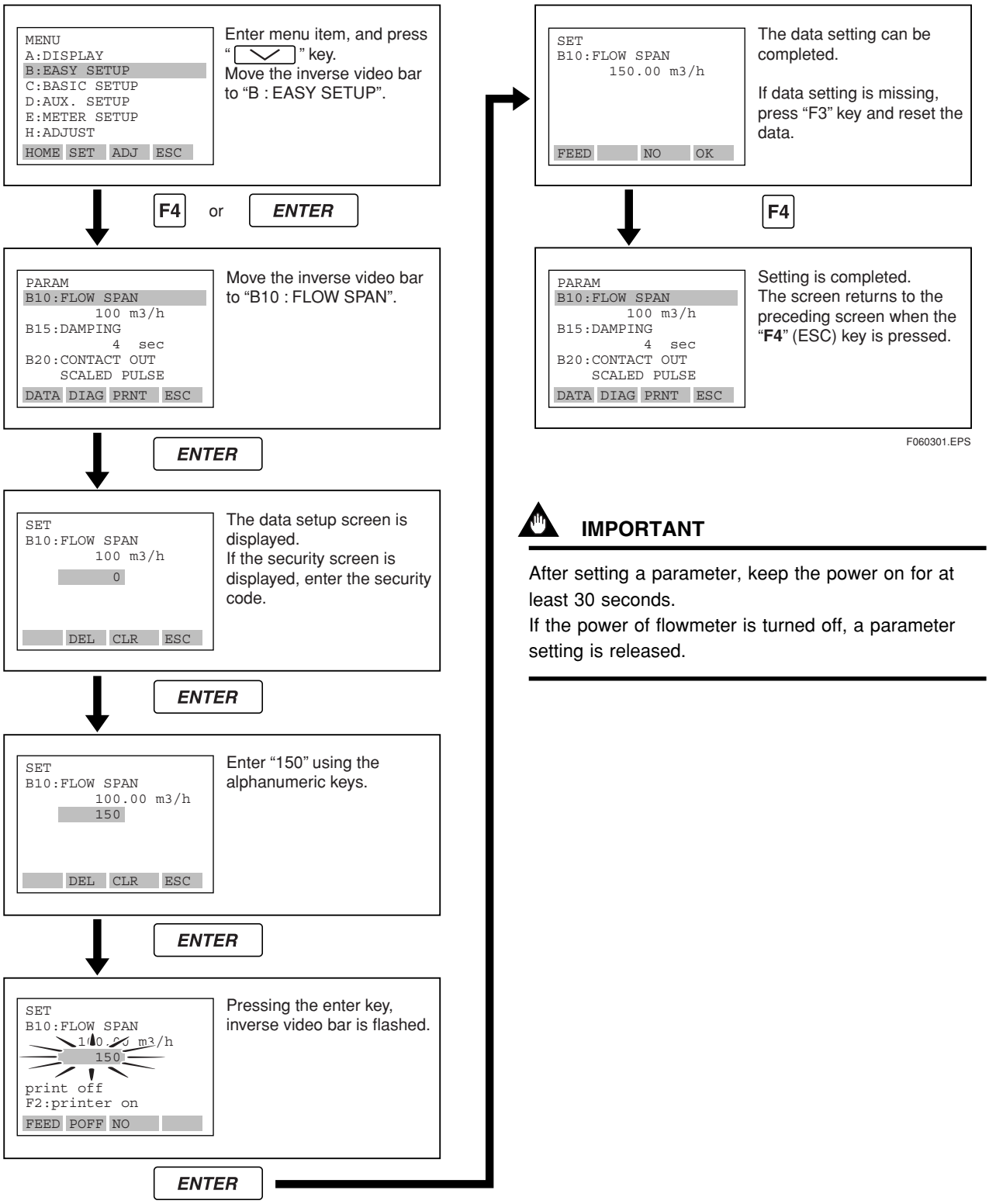
6.3 Setting Parameters

This section describes the setting method using a BRAIN Terminal (BT200). For details on the method, refer to 5.3 Parameter List.

(1) Setting Flow Span

Example : Change flow span 100m³/h to 150m³/h



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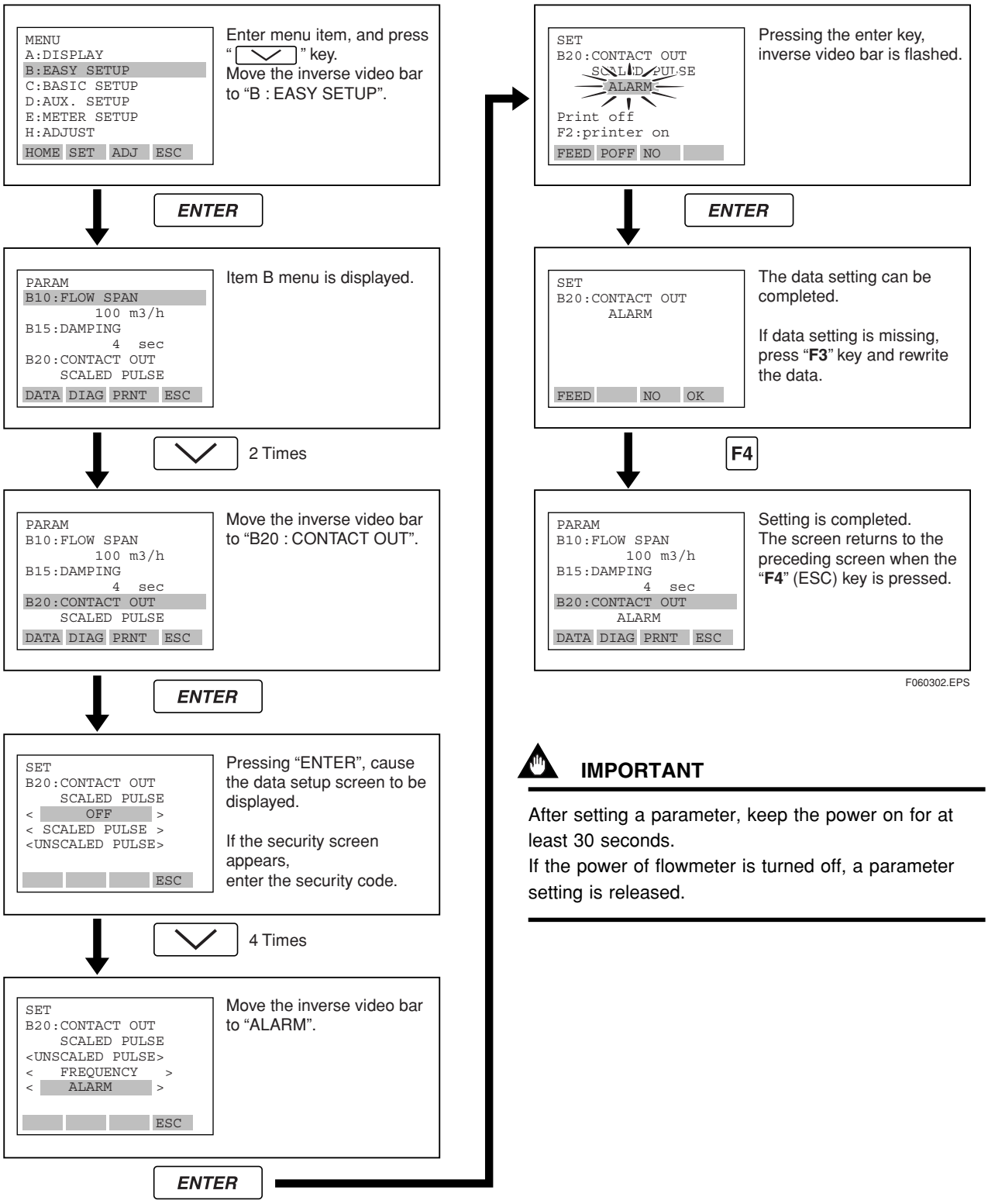
IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

(2) Change the Pulse Output to Alarm Output.



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IMPORTANT

After setting a parameter, keep the power on for at least 30 seconds.
If the power of flowmeter is turned off, a parameter setting is released.

7. OPERATION VIA HART CONFIGURATION TOOL (HART 5)

NOTE

In this User's Manual, HART protocol revision 5 and 7 are described as HART 5 and HART 7 respectively.

Note: HART is a registered trademark of the HART Communication Foundation (HCF).

7.1 HART Protocol Revision

For the models with the output signal code "-J", HART protocol revision 5 or 7 is selectable. The protocol revision is set as specified in the order.

• Confirmation by the name plate
The HART protocol revision is shown by the last number of the serial number.

In the case of the communication code "-J"

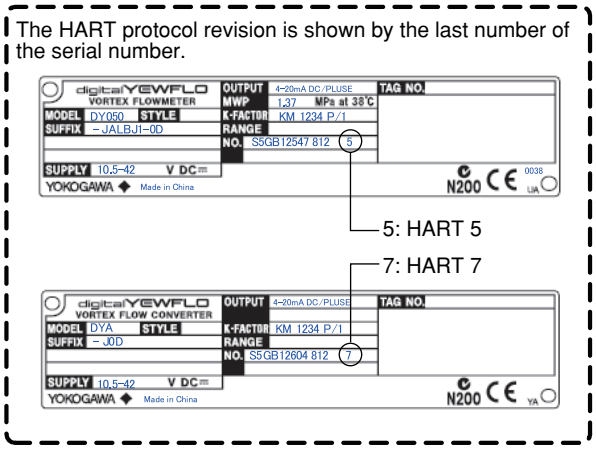

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Figure 7.1 Name Plate

7.2 Matching of instrument (digitalYEWFLO) DD and HART Configuration Tool's DD

Before using the HART Configuration Tool (such as FieldMate), confirm that the DD (Device Description) of the digitalYEWFLO is installed in the Configuration Tool before using.

DY and DYA HART 5

Device type: 0x37, Device revision: 3 or 4

IMPORTANT

Protocol revision supported by HART configuration tool must be the same or higher than that of the digital YEWFLO.

	Protocol Rev. supported by HART configuration tool	
	5	7
DY or DYA HART 5	Available	Available
DY or DYA HART 7	Not available	Available

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The DD revisions for digitalYEWFLO and Configuration Tool's can confirm in accordance with the following steps.

If the correct DD is not installed in the HART Configuration Tool, download them from the official HART programming sites, otherwise, contact the respective vendors of the Configuration Tool for its upgrade information.

1. Confirmation of the device revision for digitalYEWFLO
   Procedure to call up the field device revision
   [Root Menu] → Review → Review1
   'Fld dev rev' in the Review1 shows the revision number of correspondent field device.
2. Confirmation of the device revision for the HART Configuration Tool
   (1) Confirm the installed DD revision in accordance with the procedure of the Configuration Tool. Refer to its manual how to confirm it in detail.
   The first 2 digits of the DD file are expressed the device revision, and its last 2 digits are expressed the DD revision.

01 01.XXX
└ DD revision
└ Device revision

7.3 Set the parameters using DTM

When configure the parameters using FieldMate, use the DTM (Device Type Manager) refering to the following table.

DTM Name	Device Type	Device Revision
DYF V3.1	0 x 37	3
DYF V4.1	0 x 37	4

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7.4 Interconnection between digitalYEWFLO and HART Configuration Tool

The HART Configuration Tool can interface with the digitalYEWFLO from the control room, the digitalYEWFLO site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 250 Ω between the connection and the receiving instrument. To communicate, it must be connected in parallel with the digitalYEWFLO, and the connections must be non-polarized. Figure 7.2 illustrates the wiring connections for a direct interface at the digitalYEWFLO site. The HART Configuration Tool can be used for remote access from any terminal strip as well.

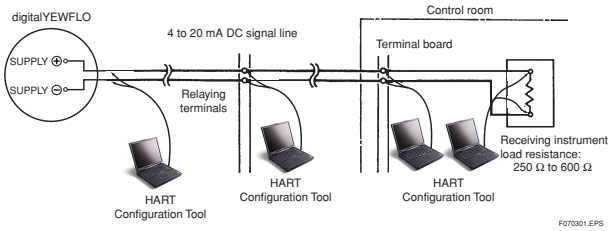

Figure 7.2 Connecting the HART Communicator

WARNING

Be sure to set parameters as “Protect” on the write protect function after finish of parameter setting work. Refer to 7.9 Software Write Protect how to use the write protect function in detail.

IMPORTANT

If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, please keep the power on for at least 30 seconds after setting parameters.

NOTE

Before updating any setting, remember to always check the data content you want to change as described in 5.4: Parameter Description.

7.5 Basic Setup

■ Tag and Device Information

The tag number and device information can be checked as follows:

• The location for the tag number and device information

Item	Precedure
Tag	**[Root Menu]** → Basic setup → Tag
Descriptor	**[Root Menu]** → Detailed setup → Device information → Descriptor
Message	**[Root Menu]** → Detailed setup → Device information → Message
Date	**[Root Menu]** → Detailed setup → Device information → Date

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When changing the tag number or device information, enter the information directly within the following limitations.

Item	Number and characters
Tag	8 *1
Descripter	16 *1
Message	32 *1
Date	2/2/2 (mm/dd/yy) • mm : month • dd : day • yy : year

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*1: All characters in the following table can be used.

SPACE	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_

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7.6 Parameter configuration

The parameter structure of the HART configuration tool is hierarchical.

Refer to 7.12, Menu Tree Example for the corresponding parameters. The menu tree shows a cross-reference of the parameters for HART configuration Tool and BRAIN Terminal.

See 5.4 Parameter Description for the functions of parameters.

Note that some display parameters of digitalYEWFLO are different from those of HART Configuration Tools.

7.7 Data Renewing and Upload/ download function

(1) Data renewing
Following data are renewed in 0.5 to 2 seconds cycle.
PV, PV%, rnge, PVAO1, Total
Temp, TV% rnge, AO3: /MV only

(2) Upload/download function
Upload/download parameters from digitalYEWFLO to the HART Configuration Tool.
Refer to the Menu Tree for the applicable parameters.

7.8 Self-diagnostic

The self-diagnostic function of the digitalYEWFLO is explained in 5.5 Error Code Lists.

It is also possible to carry out this function via HART Configuration Tool.

Procedure to call up '**Self test/Status**';

[Root Menu] → Diag/Service → **Self test/Status** *(M)

(M): METHOD

METHOD is a program to faciliate the parameter settings.

7.9 Software Write Protect

digitalYEWFLO configured data is saved by using a write protect function. The write protect status is set to "Yes" when 8 alphanumeric characters are entered in the **New password** field and transferred to the transmitter. When write protect is set to "Yes," the transmitter does not accept parameter changes. When the same eight alphanumeric string entered in the **New password** field is also entered in the **Enable wrt 10min** field and transferred to the digitalYEWFLO, it will be possible to change transmitter parameters during a 10 minute period.

To change the digitalYEWFLO from the write protect "Yes"status back to Write protect "No" status, use **Enable wrt 10min** to first release the write protect function and then enter eight spaces in the **New password** field.

7.10 HART Specific Functions

7.10.1 Burst Mode

digitalYEWFLO continuously sends the data via HART Configuration Tool when the burst mode is set on. The data is sent intermittently as a digital signal at 3 times a second.

Procedure to call up '**Burst option**' and '**Burst mode**';

(1) Setting the data to be sent
[Root Menu] → Detailed Setup → Configure outputs → HART Output → **Burst option**
Select the type of data to be sent from the following options:
- Instantaneous flow rate (PV)
- Output in % and current output (% range/current)
- Current output, PV, SV, TV, QV

(2) Setting the burst mode
[Root Menu] → Detailed Setup → Configure outputs → HART Output → **Burst mode**
Then, select "**On**" at the menu to start the burst mode.
To release from the burst mode, call up the burst mode display, and set to "**Off.**"
The default setting is "**Off.**"

7.10.2 Multidrop Mode

"Multidropping" devices refers to the connection of several transmitters to a single communications transmission line. Up to 15 devices can be connected when set in the multidrop mode. To activate multidrop communication, the device address must be changed to a number from 1 to 15. This change deactivates the 4 to 20 mA analog output, sending it to 4 mA. The alarm current is also disabled.

Setting of Multidrop Mode

(1) Polling address
- Procedure to call up the display

DD (HART 5)	**[Root Menu]** → Detailed setup → Configure outputs → HART output →
DTM (HART 5)	Configuration → HART →
→ Poll addr	Enter the number from 1 to 15

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(2) Enabling the Multidrop Mode
About the procedure to call up the **Polling** display, please refer to the User's Manual of each configuration tool.

NOTE

When the same polling address is set for two or more devices in multidrop mode, communication with these devices are disabled.

(3) Communication when set in multidrop mode.
- The HART configuration tool seaches for a device that is set in multidrop mode when it is turned on. When the HART configuration tool is connected to the device, the polling address andthe tag will be displayed.
- Select the desired device. After that, normal communication to the selected device is possible. However, the communication speed will be slow.

To release multidrop mode, call up the **Poll addr** display and the address to "0".

7.11 Other operations for the HART Configuration Tool

Regarding other operations for the HART Configuration Tool, refer to the HART Configuration Tool operations manual.

7.12 Switching HART Protocol Revision

When the output signal code is "-J", HART protocol revision of device can be selectable from 5 or 7.

The HART protocol revision is set and shipped as specified in the order.

To change the HART protocol revision after shipment, follow the procedure shown below.

IMPORTANT

When change the protocol revision, confirm the items below.

- Protocol revision supported by HART configuration tool must be the same or higher than new protocol revision of the device. (Refer to 7.2)
- Confirm that the DD or DTM which is suitable to new protocol revision of device is installed in the configuration tool. (Refer to Section 7.1 or 7.2)

7.12.1 Protocol revision change

- Call up the parameter for protocol revision change
  Procedure to call up the **Chng universal rev** display.
  [Root Menu] → Detailed setup → Device information → Revision numbers → Chng universal rev

7.12.2 Active the parameter for protocol revision change

- Active the "Chng universal rev" method

IMPORTANT

The message is displayed to separate the device from the automatic control loop.
Confirm that the device is separated.

7.12.3 Set the protocol revision number

Input the new revision number
An input column for new protocol revision number is displayed.
Input the new HART protocol revision number of "5" for HART 5 or "7" for HART 7.
Confirm the revision number in the 'Next universal rev'.
[Root Menu] → Detailed setup → Device information → Revision numbers → Next universal rev

7.12.4 Applying the new protocol revision

a. Close the configuration tool
After completion of Chng universal rev method, close the HART configuration tool.

NOTE

When using a Fieldmate, close the main display of FieldMate.

b. Restart the device
Turn off the power to the transmitter, and turn it on.

IMPORTANT

New protocol revision is applied only after having performed restart of the device.

NOTE

A new HART revision number is displayed on the indicator after restart the device.

7.12.5 Confirmation of the protocol revision number

Confirming the new protocol revision
a. Restart the HART configuration tool

NOTE

When execute the other parameter configuration or setting change, execute after restart the configuration tool.

b. Confirm the new HART protocol revision number
Callup the **Universal rev** parameter, and confirm that the new HART revision number is displayed.

- Procedure to call up the **Universal rev**. parameter.
  [Root Menu] → Review → Review1 → Universal rev
  5: HART protocol revision 5
  7: HART protocol revision 7

7.13 Menu Tree

7.13.1 DD (HART 5) Menu Tree

F071201.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal
* Upload/Download
☆ Device revision 4.0 or later

A

- Process variables
  - PV [A20] (CR)
  - PV % rnge [A10] (CR)
  - AO1 (CR)
  - Total [A30] (CR)
  - (MV) Temp [A41] (CR)
  - (MV) TV % rnge [A40] (CR)
  - (MV) AO3 (CR)

B

- Diag/Service
  - Self test/Status
    - Self test (M)
    - Status
      - Status group 1 (R) Status group 1 enum
      - Status group 2 (R) Status group 2 enum
      - Status group 3 (R) Status group 3 enum
  - Loop test (M)
  - Test output — Method①
    - Out analog [J10] (RW)
    - Out pulse [J20] (RW)
    - Out Status [J30]
      - Off
      - On
    - End
  - D/A trim (M)
  - Scaled D/A trim (M)
  - Test auto release time
  - Master reset (M)

Status group 1 enum
- Flow over output
- Span set error
- Pulse out over
- Pulse set error
- Device ID not entered
- Sensor fault
- Pre-amp fault
- EEPROM fault

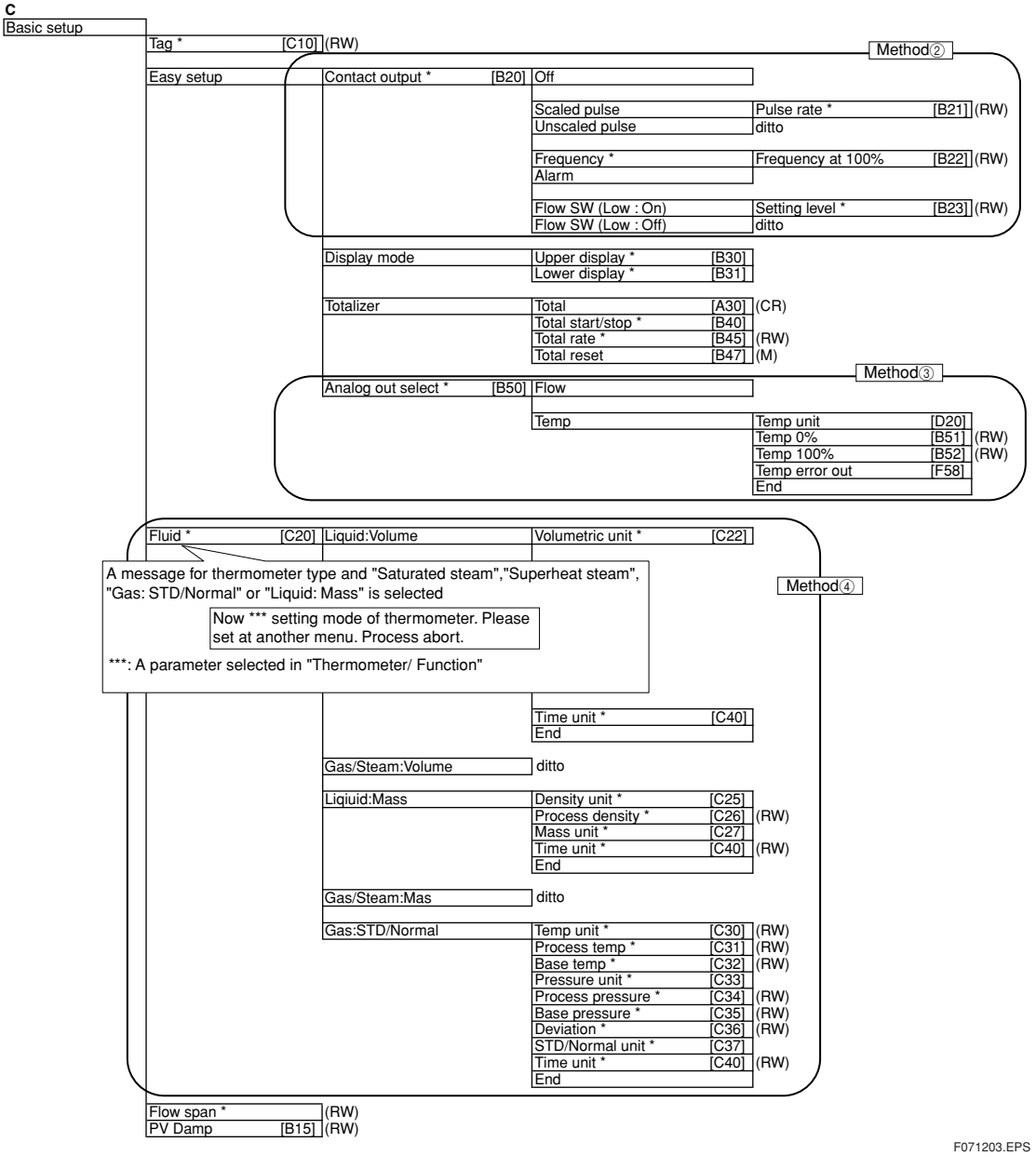
Status group 2 enum
- Transient noise
- High vibration
- Clogging
- Fluctuating

Status group 3 enum
- Temp over output
- Over temp
- Temp sensor fault
- Temp convert fault

F071202.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal
* Upload/Download

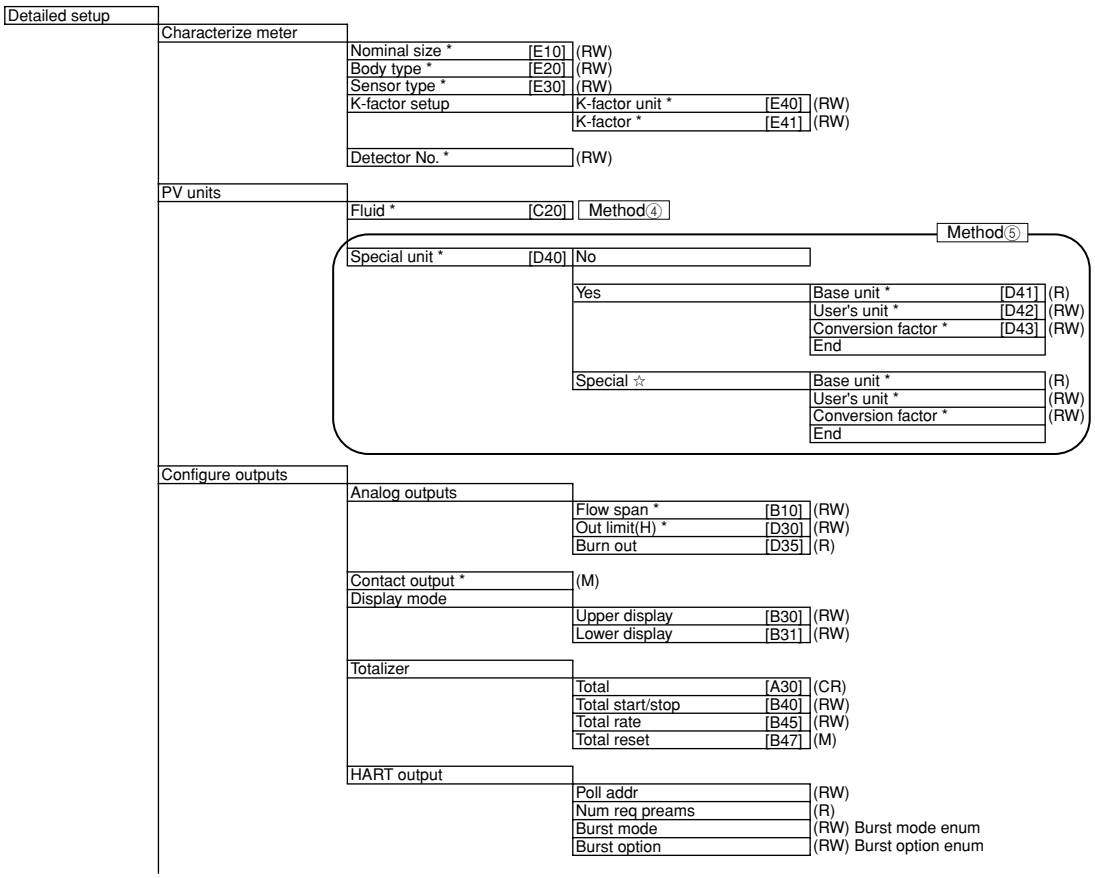


F071203.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal
* Upload/Download
☆ Device revision 4.0 or later

D



To be continued to next page (D1)

Burst mode enum
- Off
- On

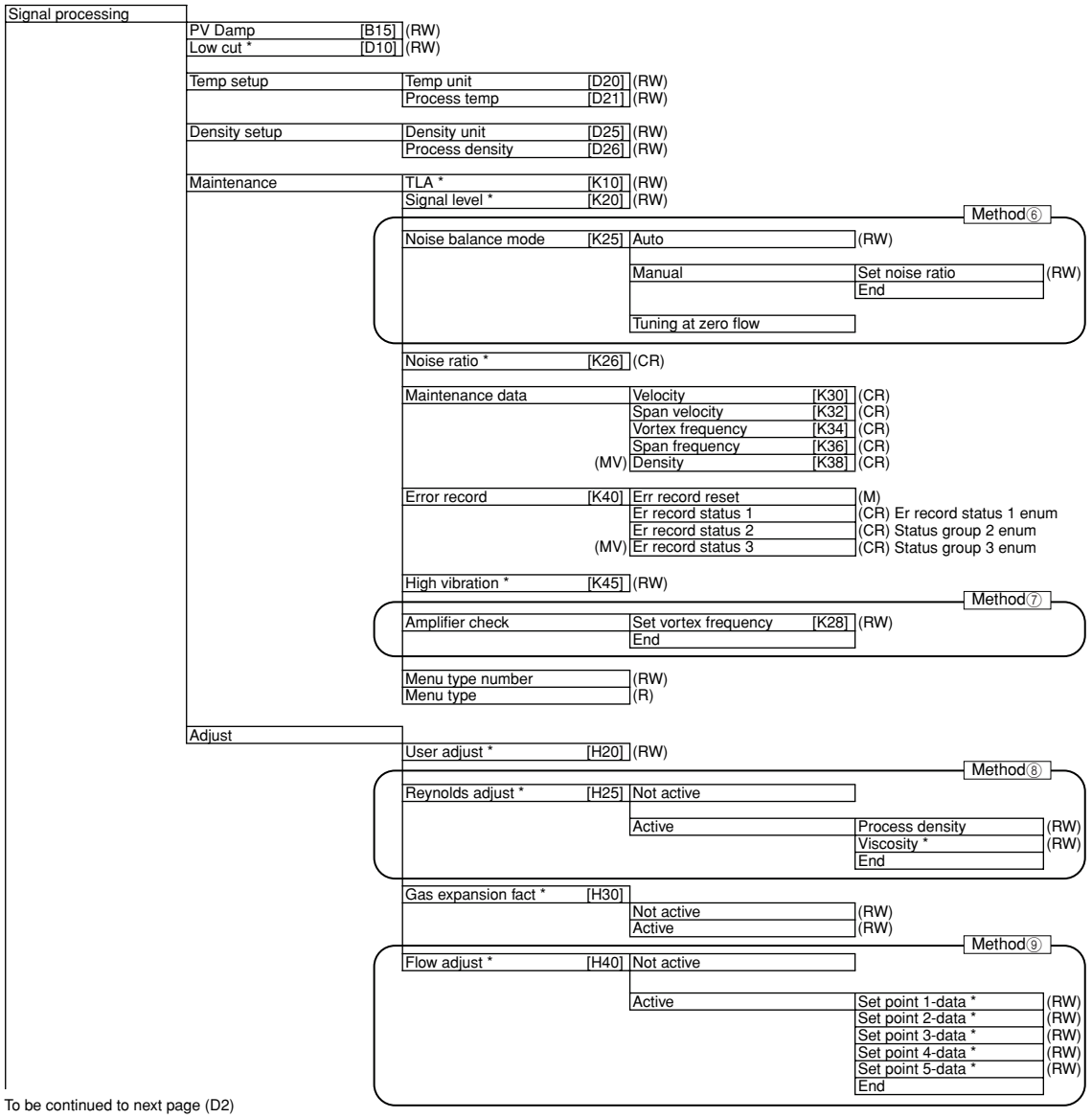
Burst option enum
- PV
- %range/current
- Process vars/crnt

F071204.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal
* Upload/Download
☆ Device revision 4.0 or later

D1



To be continued to next page (D2)

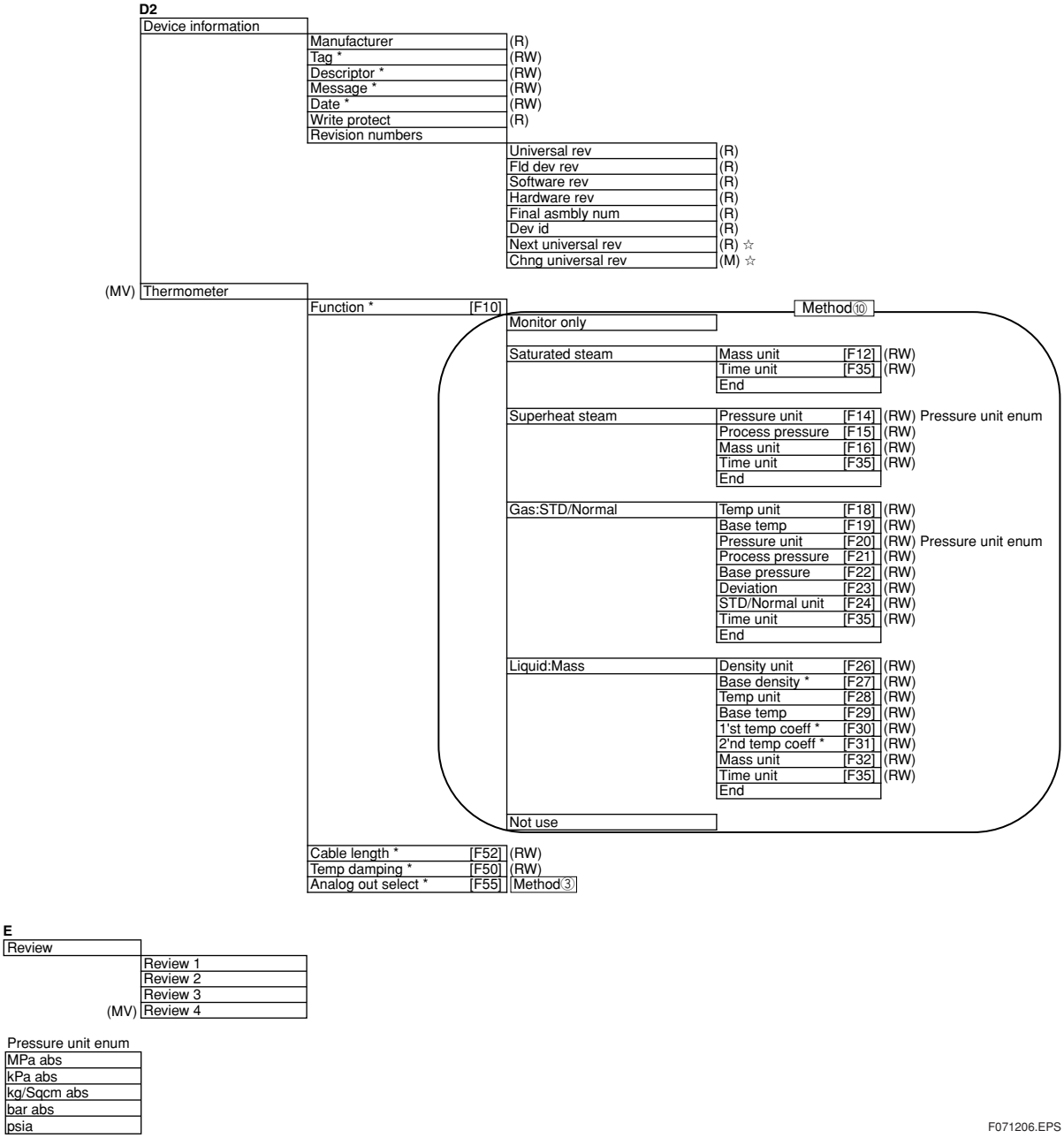
Er record status 1 enum

Flow over output
Span set error
Pulse out over
Pulse set error
Sensor fault
Pre-amp fault
EEPROM fault

F071205.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal
* Upload/Download
☆ Device revision 4.0 or later



Pressure unit enum

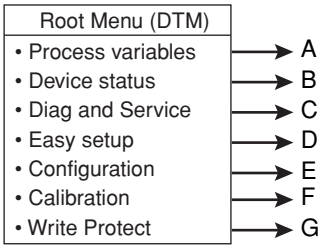
MPa abs
kPa abs
kg/Sqcm abs
bar abs
psia

F071206.EPS

Review 1	Review 2	Review 3	Review 4
Model	Flow rate unit	Special unit	Function
Manufacturer	Flow span	User's unit	Base density
Distributor	PV Damp	Conversion factor	1'st temp coeff
Tag	Contact output	Nominal size	2'nd temp coeff
Descriptor	Pulse rate	Body type	Cable length
Message	Frequency at 100%	Sensor type	Temp damping
Date	Setting level	K-factor	Analog out select
Dev id	Upper display	Detector No	Temp 0%
Write protect	Lower display	User adjust	Temp 100%
AO Alrm typ	Total rate	Reynolds adjust	Temp error out
Universal rev	Total start/stop	Viscosity	(Only fo /MV)
Fld dev rev	Fluid	Gas expansion fact	
Software rev	Process density	Flow adjust	
Hardware rev	Process temp	TLA	
Poll addr	Base temp	Signal level	
Burst mode	Process pressure	Noise balance mode	
Burst option	Base pressure	Noise ratio	
Num req preams	Deviation	High vib.	
	Low cut	Span velocity	
	Out limit (H)	Span frequency	
	Burn out		

F071207.EPS

7.13.2 DTM (HART 5) Menu Tree



F071208.EPS

A

	Process Variables		
	PV	[A20]	(R)
	PV % rng	[A10]	(R)
	AO1		(R)
	Flow span	[B10]	(R)
	PV damp	[B15]	(R)
	Total	[A30]	(R)
(MV)	Temp	[A41]	(R)
(MV)	TV % rnge	[A40]	(R)
(MV)	AO3		(R)
(MV)	Temp 0%	[B51]	(R)
(MV)	Temp 100%	[B52]	(R)
(MV)	Temp damping	[F50]	(R)

B

	Device Status		
	Process Variables		
	PV	[A20]	(R)
	PV % rnge	[A10]	(R)
(MV)	TV % rnge	[A41]	(R)
(MV)	Temp	[A40]	(R)
	Diagnostic List		
	Device Status		(R)
	Status group1		(R) Status group 1 enum
	Status group2		(R) Status group 2 enum
(MV)	Status group3		(R) Status group 3 enum

C

	Diag and Service		
	Loop test		(M)
	Loop test pulse/status		(M)
	Amplifier check		(M)
	Test auto release time	[J40]	(RW) ☆
	Master reset		(M)
	Error Record		
	Er record status 1		(R) Er record group 1 enum
	Er record status 2		(R) Status group 2 enum
	Er record status 3		(R) Status group 3 enum

D

	Easy Setup		
	Tag		(RW)
	Contact output	[B20]	(R)
	Contact output		(M)
	Pulse rate	[B21]	(R)
	Freq at 100%	[B22]	(R)
	Setting level	[B23]	(R)
	Flow span	[B10]	(RW)
(MV)	Analog out select	[B50]	(R)
(MV)	Analog out select		(M)
	Temp 0%	[B51]	(R)
	Temp 100%	[B52]	(R)
	PV Damp	[B15]	(RW)
(MV)	Temp damping	[F50]	(RW)
	Total rate	[B45]	(RW)
	Upper display	[B30]	(RW)
	Lower display	[B31]	(RW)

F071209.EPS

E

	Configuration		
	Meter		
	Nominal size	[E10]	(RW)
	Body type	[E20]	(RW)
	Sensor type	[E30]	(RW)
	K-factor unit	[E40]	(RW)
	K-factor	[E41]	(RW)
	Detector No	[E50]	(RW)
	Cable length	[F52]	(RW)
	Upper display	[B30]	(RW)
	Lower display	[B31]	(RW)
	Flow Setting		
	Sensor status		(R)
(MV)	Function		(R)
(MV)	Function		(M)
	Fluid		(R)
	Fluid		(M)
	Indicate parameter depends on the choice in 'Fluid/Function'.		
	Special Units		
	Special unit	[D40]	(R)
	Special unit		(M)
	Base unit	[D41]	(R)
	User's unit	[D42]	(R)
	Conversion factor	[D43]	(R)
	Total		
	Total	[A30]	(R)
	Total start/stop	[B40]	(RW)
	Total rate	[B45]	(RW)
	Total reset		(M)
	Adjust		
	User adjust	[H20]	(RW)
	Raynolds adjust	[H25]	(R)
	Raynolds adjust		(M)
	Process density	[K36]	(R)
	Gas expansion fact	[H30]	(RW)
	Flow adjust	[H40]	(R)
	Flow adjust		(M)
	Indicate parameter only when 'Flow adjust' is activated.		
	Maintenance		
	Lowcut	[D20]	(RW)
	TLA	[K10]	(RW)
	Signal level	[K20]	(RW)
	Noise balance mode	[K25]	(R)
	Noise balance mode		(M)
	Noise ratio	[K26]	(R)
	High vibration	[K45]	(RW)
	Velocity	[K30]	(R)
	Span Velocity	[K32]	(R)
	Vortex frequency	[K34]	(R)
	Span frequency	[K36]	(R)
	Menu type number		(RW)
	Analog Output		
	Flow span	[B10]	(RW)
	PV Damp	[B15]	(RW)
	AO Arlm typ		(R)
	Out limit(H)	[D30]	(RW)
(MV)	Analog out select	[B50]	(R)
(MV)	Analog out select		(M)
(MV)	Temp damping	[F50]	(RW)
	Device information		
	Model		(R)
	Manufacturer		(R)
	Hardware rev		(R)
	Software rev		(R)
	Descriptor		(RW)
	Massage		(RW)
	Date		(RW)
	Final asmbly num		(RW)
	HART		
	Tag		(RW)
	Poll addr		(RW)
	Dev id		(R)
	Universal rev		(R)
	Fld dev rev		(R)
	Next universal rev		(R) ☆
	Chng universal rev		(M) ☆
	Num req preams		(R)
	Physical signl code		(R)
	Burst mode		(RW) Burst mode enum
	Burst option		(RW) Burst option enum

F

	Calibration		
	D/A trim		(M)
	Scaled D/A trim		(M)

G

	Write Protect		
	write protect		(M)
	Software seal		(R)

F071210.EPS

8. OPERATION VIA HART CONFIGURATION TOOL (HART 7)

NOTE

In this User's Manual, HART protocol revision 5 and 7 are described as HART 5 and HART 7 respectively.

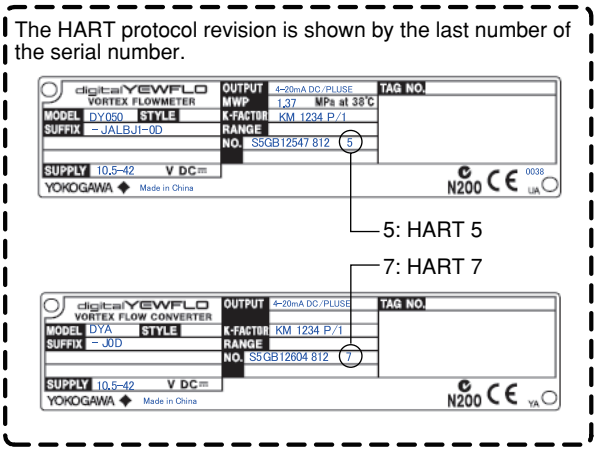
Note: HART is a registered trademark of the HART Communication Foundation (HCF).

8.1 HART Protocol Revision

For the models with the output signal code "-J", HART protocol revision 5 or 7 is selectable. The protocol revision is set as specified in the order.

• Confirmation by the name plate
The HART protocol revision is shown by the last number of the serial number.

In the case of the communication code "-J"



F080001.EPS

Figure 8.1 Name Plate

8.2 Matching of instrument (digitalYEWFLO) DD and HART Configuration Tool's DD

Before using the HART Configuration Tool (such as FieldMate), confirm that the DD (Device Description) of the digitalYEWFLO is installed in the Configuration Tool before using.

DY and DYA HART 7;

Device type: 0x370B, Device revision: 10

IMPORTANT

Protocol revision supported by HART configuration tool must be the same or higher than that of the device.

	Protocol Rev. supported by HART configuration tool	
	5	7
DY or DYA HART 5	Available	Available
DY or DYA HART 7	Not available	Available

T080201.EPS

The DD revisions for digitalYEWFLO and Configuration Tool's can confirm in accordance with the following steps.

If the correct DD is not installed in the HART Configuration Tool, download them from the official HART programming sites, otherwise, contact the respective vendors of the Configuration Tool for its upgrade information.

1. Confirmation of the device revision for digitalYEWFLO
   - Procedure to callup the field device revision; [Root Menu] → Review → Review1
   - 'Fld dev rev' in the Review1 shows the revision number of correspondent field device.
2. Confirmation of the device revision for the HART Configuration Tool
   (1) Confirm the installed DD revision in accordance with the procedure of the Configuration Tool. Refer to its manual how to confirm it in detail. The first 2 digits of the DD file are expressed the device revision, and its last 2 digits are expressed the DD revision.

01 01.XXX
DD revision
Device revision

8.3 Set the parameters using DTM

When configure the parameters using FieldMate, use the DTM (Device Type Manager) reffering to the following table.

DTM Name	Device Type	Device Revision
DYF HART 7 DTM	0 x 370B	10

T080301.EPS

8.4 Interconnection between digitalYEWFLO and HART Configuration Tool

The HART Configuration Tool can interface with the digitalYEWFLO from the control room, the digitalYEWFLO site, or any other wiring termination point in the loop, provided there is a minimum load resistance of 250 Ω between the connection and the receiving instrument. To communicate, it must be connected in parallel with the digitalYEWFLO, and the connections must be non-polarized. Figure 8.2 illustrates the wiring connections for a direct interface at the digitalYEWFLO site. The HART Configuration Tool can be used for remote access from any terminal strip as well.

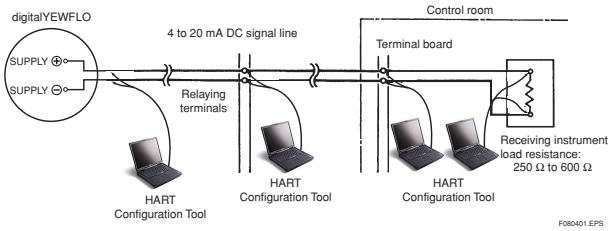


Figure 8.2 Connecting the HART Communicator

WARNING

Be sure to set parameters as “Protect” on the write protect function after finish of parameter setting work.
Refer to 8.9 Software Write Protect how to use the write protect function in detail.

IMPORTANT

If the power of flowmeter is turned off within 30 seconds after parameters have been set, these settings will be canceled. Accordingly, please keep the power on for at least 30 seconds after setting parameters.

NOTE

Before updating any setting, remember to always check the data content you want to change as described in 5.4: Parameter Description.

8.5 Basic Setup

■ Tag and Device Information

The tag number and device information can be checked as follows:

• Procedure to call up the tag number and device information

Tag	**[Root Menu]** → Basic setup → Tag or **[Root Menu]** → Detailed setup → Device information → Tag or **[Root Menu]** → Review → Review1 → Tag
Long Tag	**[Root Menu]** → Basic setup → Long Tag or **[Root Menu]** → Detailed setup → Device information → Long Tag or **[Root Menu]** → Review → Review1 → Long Tag
Descriptor	or **[Root Menu]** → Detailed setup → Device information → Descriptor or **[Root Menu]** → Review → Review1 → Descriptor
Message	or **[Root Menu]** → Detailed setup → Device information → Message or **[Root Menu]** → Review → Review1 → Message
Date	or **[Root Menu]** → Detailed setup → Device information → Date or **[Root Menu]** → Review → Review1 → Date

T080501.EPS

When changing the tag number or device information, enter the information directly within the following limitations.

Item	Limitations
Tag	Up to 8 characters or numbers*1
Long Tag (HART 7 only)	Up to 32 characters or numbers*2
Descriptor	Up to 16 characters or numbers*1
Message	Up to 32 characters or numbers*1
Date	yyyy/mm/dd - mm : month (2 digits) - dd : days (2 digits) - yy : years (2 digits)*3

T080502.EPS

*1: The characters bounded by the thick line in the following table can be used.
*2: All characters in the following table can be used.
*3: It depends on the HART Configuration Tool.

SPACE	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	

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8.6 Parameter configuration

The parameter structure of the HART configuration tool is hierarchical.

Refer to 8.11 Menu Tree Example for the corresponding parameters. The menu tree shows a cross-reference of the parameters for HART configuration Tool and BRAIN Terminal.

See 5.4 Parameter Description for the functions of parameters.

Note that some display parameters of digitalYEWFLO are different from those of HART Configuration Tools.

8.7 Data Renewing and Upload/ download function

(1) Data renewing
Following data are renewed in 0.5 to 2 seconds cycle.
PV, PV%, rnge, Loop Current, Total
Temp, TV% rnge, : /MV only

(2) Upload/download function
Upload/download parameters from digitalYEWFLO to the HART Configuration Tool.
Refer to the Menu Tree for the applicable parameters.

8.8 Self-diagnostic

The self-diagnostic function of the digitalYEWFLO is explained in 5.5 Error Code Lists.

The followings are additional items of the self-diagnostic function.
- Burst configuration error: Burst mode setting error.
- Device variable simulation: Executing Device variable simulation function.

The HART configuration tool is able to execute METHOD (*) of 'Self test/Status'. Confirm the error.

• Procedure to call up the Self test/Status;

[Root Menu] → Diag/Service → Self test/Status

(*) 'Method' is a program to faciliate the parameter settings.

8.9 Software Write Protect

digitalYEWFLO configured data is saved by using a write protect function. The write protect status is set to "Yes" when 8 alphanumeric characters are entered in the **New password** field and transferred to the device. When write protect is set to "Yes," the device does not accept parameter changes. When the same eight alphanumeric string entered in the **New password** field is also entered in the **Enable wrt 10min** field and transferred to the digitalYEWFLO, it will be possible to change device parameters during a 10 minute period.

To change the digitalYEWFLO from the write protect "Yes"status back to Write protect "No" status, use **Enable wrt 10min** to first release the write protect function and then enter eight spaces in the **New password** field.

8.10 HART Specific Functions

8.10.1 Process Variable Setup

The device deals with four data (flow rate, temperature, density and total flow rate). In case of /MV, these four data are allocated to PV(Primary Variable), SV(Secondary Variable), TV(Tertiary Variable) and QV(Quaternary Variable). The variable of PV is 4 to 20mA current output. Therefore, the total flow rate do not allocate to PV. (Except / MV, each dynamic variables are fixed at factory setting.)

Dynamic Variable	Choice items	Factory Setting
PV	Flow rate, Temperature	Instantaneous Flowrate
SV	Flow rate, Total, Temperature, Density	Total Flowrate
TV	Flow rate, Total, Temperature, Density	Fluid Temperature
QV	Flow rate, Total, Temperature, Density	Fluid Density

T081001.EPS

• Procedure to call up the Dynamic variable assignments.

[Root Menu] → Detailed setup → Configure outputs → HART output →
Dynamic variable assignments → PV is
→ SV is
→ TV is
→ QV is
→ Chng dyn var assign (METHOD)

Update time period of each measurement value is as follows;
- Flow rate: Flow rate Update time period
- Total: Total Update time period
- Temperature: Temperature Update time period
- Density: Density Update time period

8.10.2 Burst Mode

When the **Burst mode** is enabled, the device continuously sends up to three data listed in Table 8.1.
Refer to the subsection 8.10.2.1 Burst Message for details.

When the **Burst mode** is set to "Wired HART Enabled", transmitter continuously sends alarm signal also.
Refer to subsection 8.10.3 Event Notification for detail.

When changing the setting of **Burst mode**, set "Off" to the **Burst mode**. Default setting is "Off".

8.10.2.1 Burst Message

The parameters for Burst Message are as follows.

- Transmit data: command parameters of Burst Command
- Device variables:
- Update period
- Transmit condition: choice in Burst Msg Trigger Mode

Refer to Table 8.1 for the combination between command parameter and transmit condition.

Refer to 8.10.2.2 for the procedure of Burst Mode.

[Root Menu] → Detailed setup → Configure outputs → HART output → Burst Condition → Burst Message1, 2, 3 → Burst command

NOTE

- In case of Burst Mode setting change, confirm Burst Mode parameter is OFF.
- Prioritize to use the 'Burst Message 1'.

Table 8.1 Burst parameters

Command parameter	Burst Command	Burst Msg Trigger Mode	Burst Trigger Source	Burst Trigger Units
PV (flow rate)	Cmd1:PV	Continuous	---	---
		Window	PV	Depends on the assigned variable to PV
		Rising		
		Falling		
		On-change		
% range/current (Percent of range, Loop current)	Cmd2: % range/current	Continuous	---	---
		Window	% range	%
		Rising		
		Falling		
		On-change		
Process vars/current (Loop current, PV, SV, TV, QV)	Cmd3:Dyn vars/ current	Continuous	---	---
		Window	PV	Depends on the assigned variable to PV
		Rising		
		Falling		
		On-change		
Process vars/%range/current with status*1 (Select from flow rate, total flow, temperature, density, percent of range, loop current, PV, SV, TV, and QV)*2	Cmd9:Device vars w/Status	Continuous	---	---
		Window	Top of Burst Device Variables	Depends on maapping
		Rising		
		Falling		
		On-change		
Process vars/%range/current (Select from flow rate, total flow, Temperature, Density, percent of range, loop current, PV, SV, TV, and QV)*2	Cmd33:Device Variables	Continuous	Top of Burst Device Variables	Depends on the assigned variable to Burst Device Variable
		Window		
		Rising		
		Falling		
		On-change		
Self diagnosis information	Cmd48:Read Additional Device Status	Continuous	---	---
		On-change	All status	---

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*1: Output the data with time and status.

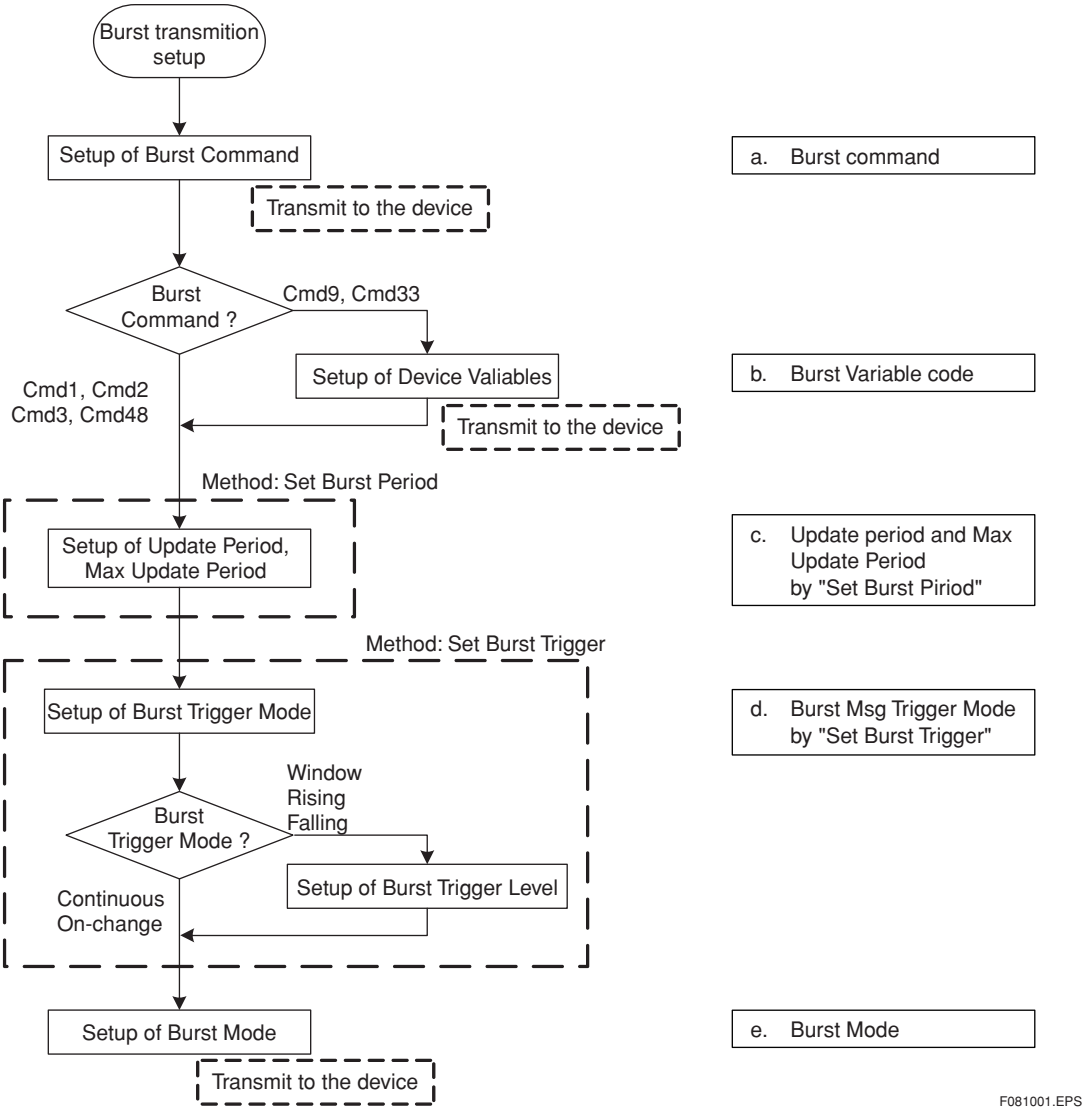
*2: Select at **Burst Device Variables**

8.10.2.2 Burst mode setting procedure

• Procedure to call up the display

DD (HART 7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output → Burst Condition → Burst Message 1,2 or 3 → Burst Command

T081003.EPS



F081001.EPS

a. Burst Command

Select the transmission data at **Burst Command** parameter.

Burst Command	Command parameter
Cmd1:PV	Variable assigned to PV
Cmd2:% range/current	% range/current (Percent of rang, Loop current)
Cmd3:Dyn vars/current	Process vars/current (Loop current, PV, SV, TV, QV)
Cmd9:Device vars w/Status	Process vars/% range/current Mapping by user
Cmd33:Device Variables	Process vars/% range/current Mapping by user
Cmd48:Read Additional Device Status	Self diagnosis information

T081004.EPS

b. Burst Variable Code

This parameter is possible to be set when **Burst Command** is Cmd9:Device vars w/Status (up to eight items) and Cmd33: Device Variables (up to four items).

Set device variables to a bare minimum to avoid to get the communication time longer.

• Procedure to call up the display

DD (HART 7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output → Burst Condition → Burst Message1, 2 or 3 → Burst Device Variables → Burst Variable Code →
Display Item	Contents
Flowrate	Flowrate
Total	Total flow
Temperature	Temperature
Density	Density
%rnge	Select the % output
Loop current	Select the output current
PV	Select the PV value
SV	Select the SV value
TV	Select the TV value
QV	Select the QV value
Not use	–

T081005.EPS

c. Update period and Max Update Period

Set to **Update Period** and **MaxUpdate Period**.

Set greater value of update period than a value which is set in each process value.

For **Update Period**, set the value that is smaller than **Max Update Period**.

• Procedure to call up the display

DD (HART 7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output → Burst Condition → Burst Message1, 2 or 3 → Set Burst Period →
→ **Update Period** /Max Update Period	0.5 s
	1 s
	2 s
	4 s
	8 s
	16 s
	32 s
	1 min
	5 min
	10 min
	15 min
	30 min
	45 min
	60 min

T081006.EPS

d. Burst Msg Trigger Mode

Set The **Burst Msg Trigger Mode** from the parameters shown below.
When **Burst Msg Trigger Mode** is Window, Rising or Falling, set the **Burst Trigger Level**.

• Procedure to call up the display

DD (HART 7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output → Burst Condition → Burst Message1, 2 or 3 → Set Burst Trigger →
Display Item	Contents
Continuous	Burst Message is transmitted contiuously.
Window	It detects that the absolute value of the amount of change of a device variable value became beyond the preset value of Burst Trigger Level, and transmits.
Rising	It detects that the device variable value became beyond the preset value of Burst Trigger Level, and transmits.
Falling	It detects that the device variable value turned into below the preset value of Burst Trigger Level, and transmits.
On-change	It detects that the device variable value changed and transmits.

*1: Check transmitting conditions with the cycle set as Update Period, and when it corresponds to conditions, they transmit.
Moreover, even if it does not correspond to conditions, it transmits compulsorily with the cycle set up by Max Update Period.

T081007.EPS

e. Burst Mode

When the **Burst mode** is set to Wired HART Enabled, the device starts to send the data.

• Procedure to call up the display

[Root Menu] → Detailed setup → Configure outputs → HART output → Burst condition → Burst Message1, 2 or 3 → Burst mode → Wired HART Enabled

8.10.3 Event Notification

When a setting change and a change of the Self-diagnostics occur, device detect it as an event and can transmit an alarm signal continuously.

Alarm contained in the following item can be set to Event, and can be detected.

• Device Status
• Status group 1 to 3
• Ext dev status
• Device diagnostic status 0

Up to four events that occurred can be stored.
When using this function, set to **Burst mode** as "Wired HART Enabled".

8.10.3.1 Set Event Notification

• Procedure to call up the display

DD (HART 7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output → Event Notification
→ Event Notification Control	Stop the event monitor: OFF Shift to the monitor state: Enable event notification on token-passing data link layer
→ Event Mask	Set the status to detect
→ Event Notification Retry Time	Set the retry time when the event occur.
→ Max Update Time	Set the retry time when the event does not occur.
→ Event Debounce Interval	The setting of the minimum event duration

T081008.EPS

a) Event Mask

Set the status to detect in the **Event Mask** parameter.

Device Status Mask
Status group 1 to 3
Ext dev status Mask
Device Diagnostic Status 0 Mask

T081009.EPS

b) Event Notification Retry Time/ Max Update Time/ Event Debounce Interval

Set to Event Notification Retry Time, Max Update Time and Event Debounce Interval.
For **Event Noteification Retry Time**, set the value thet is smaller than **Max Update Time**.

Event Notification Retry Time/Max Update Time	Event Debounce Interval
---	Off
0.5 s	0.5 s
1 s	1 s
2 s	2 s
4 s	4 s
8 s	8 s
16 s	16 s
32 s	32 s
1 min	1 min
5 min	5 min
10 min	10 min
15 min	15 min
30 min	30 min
45 min	45 min
60 min	60 min

T081010.EPS

c) Event Notification Control

Select "Enable event notification on token-passing data link layer" in the **Event Notification Control** parameter to shift to the monitor state:

8.10.3.2 Acknowledge Event Notification (DTM)

The transmission of the event message stops when event is approved.

• Procedure to call up the display

DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output → Event Notification → Knowledge →
→ Acknowledge Event Notification	Acquisition of the event number and approval.

T081011.EPS

a) Get Event Number

Confirm the latest event number.
Execute **Acknowledge Event Notification** method.

1) Set "0" to enter Event Number.
2) OK.
3) Set "Trans 0: Read Event Notification" to Select Transaction.
4) OK.
5) Confirm Event Number.

b) Acknowledge Event Notification

Execute **Acknowledge Event Notification** method.

1) Set the event number which is confirmed in a)5 to enter Event Number.
2) OK.
3) Set "Trans 1: Send Acknowledge" to Select Transaction.
4) OK.
5) Confirm Event Status is 0x00.

8.10.3.3 Event Notification Record (DTM)

• Procedure to call up the display

DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output → Event Notification → Knowledge →
→ Acknowledge Event Notification	Acquisition of the event number and approval.

T081012.EPS

a) Get Event Number

Confirm the latest event number.
Execute **Acknowledge Event Notification** method.

1) Set "0" to enter Event Number.
2) OK.
3) Set "Trans 0: Read Event Notification" to Select Transaction.
4) OK.
5) Confirm Event Number.

b) Confirmation record of Event Notification

Confirm four events checked in a).

1) Set the event number which is confirmed in a)5 to enter Event Number.
2) OK.
3) Set "Trans 0: Read Event Notification" to Select Transaction.
4) OK.
5) Knowledge menu displays events record.

Ex.) When the confirmed event number is 123.

Event Number	Explanation
123	The latest event
122	An event before the once.
121	An event before the twice.
120	An event before three times.

T081013.EPS

8.10.4 Multidrop Mode

"Multidroping" devices refer to the connection of several devices to a single communication transmission line. Up to 63 devices can be connected when set in the multidrop mode. To activate multidrop communication, the device address must be changed to a number from 1 to 63. If it sets to multidrop mode, in order to transmit all the data in digital one, it is necessary to change a setup of the analog signal output of four to 20 mA.

Setting of Multidrop Mode

(1) Polling address

• Procedure to call up the display

DD (HART 7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → HART output →
→ Poll addr	Enter the number from 1 to 63

T081014.EPS

(2) Enabling the Multidrop Mode

About the procedure to call up the **Polling** display, refer to the User's Manual of each configuration tool.

Usually, set Disable to Loop current mode and fix an analog output signal to 4mADC. It becomes impossible in this case, to also use a burnout output.

However, in the case of the application which receives and operates an analog output signal, an analog output signal can be used for one loop to variable one set, setting it up. In this case, set Enable to Loop current mode.

• Procedure to call up the display

DD (HART 7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Configure outputs → Analog output → Loop current mode →
Enabled	Loop current mode is enabled.
Disabled	Loop current mode is disabled.

T081015.EPS

NOTE

When the same polling address is set for two or more devices in multidrop mode, communication with these devices are disabled.

(3) Communication when set in the multidrop mode.

• The HART configuration tool searches for a device that is set in multidrop mode when it is turned on. When the HART configuration tool is connected to the transmitter, the polling address and the tag will be displayed.

• Select the desired device. After that, normal communication to the selected device is possible. However, the communication speed will be slow.

To release multidrop mode, call up the **Poll addr** display and set the address to "0".

Return Loop current mode to Enable.

8.10.5 Loop test, Simulation, Squawk

8.10.5.1 Loop test

This feature can be used to output a fixed current for loop checks.

• Procedure to call up the Loop test (Method)

[Root Menu] → Diag/Service → Loop test

8.10.5.2 Device Variable Simulation Function (Effective only when setting to HART 7)

Using the simulation function, the output signal can be confirmed by setting any value and status to the selected device variable.
Call up the parameter (Method) and follow the message shown.
After completing the step 5 in the next table, the simulation starts.

• Procedure of device variable simulation

step 1	Call up the parameter	**[Root Menu]** → Diag/Service → Simulate (M)
2	Selection of Device Variable	Select one parameter from the list below Off Flow rate Total Temperature Density Percent range Loop Current
3	Setting of Value	Input the simulate value
4	Setting of Data quality	Select one parameter from the list below Bad Poor accuracy Manual / Fixed Good
5	Setting of Limit status	Select one parameter from the list below Not limited Low limited High limited Constant

T081016.EPS

NOTE

- The simulations act on current, LCD display, communication and alarm.
- The simulation of total flow rate acts on LCD display and communication, not on measuring total flow rate.
  The measuring total flow rate is continuosly working during simulation.

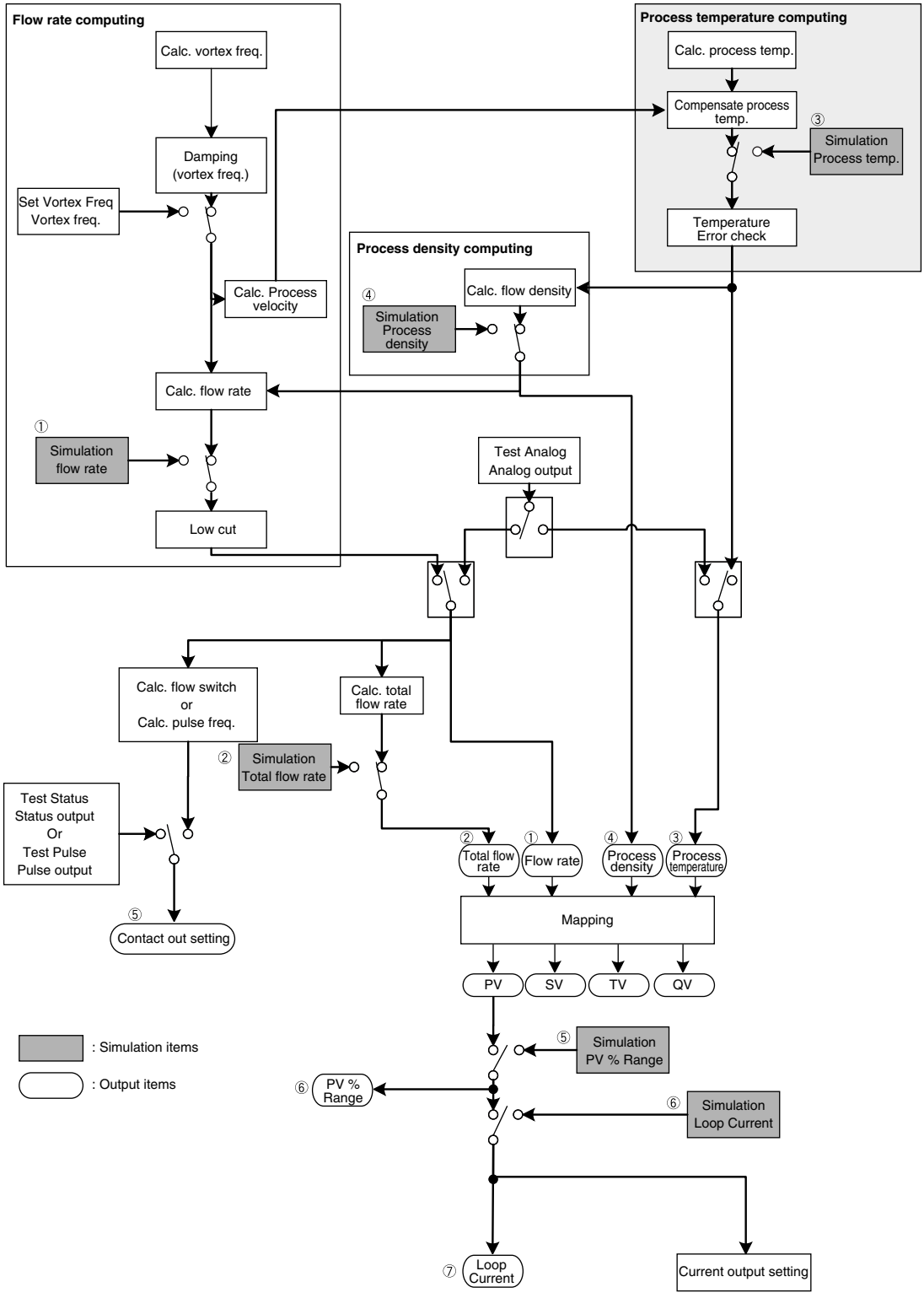


Figure 8.3 Simulation Flow

• Simulation Setting and Correlation of Output Value

<Case A>: Without /MV option

Simulation Setting value	Output value						
	Flow rate ①	Total flow rate ②	Process temperature ③	Process density ④	Contact output ⑤	PV % Range ⑥	Loop Current ⑦
Flow rate	Yes	Yes	No	No	Yes	Yes	Yes
Total flow rate	No	Yes	No	No	No	No	No
Process temperature	No	No	Yes	No	No	No	No
Process density	No	No	No	Yes	No	No	No
PV % Range	No	No	No	No	No	Yes	Yes
Loop Current	No	No	No	No	No	No	Yes

Yes : Simulation value or calculation result of Simulation.
No : Actual process value or parameter setting value.

T081014.EPS

<Case B>: With /MV option
<Case B-1>: Function == "Monitor only"
<Case B-2>: Function == "Saturated steam" or "Superheat steam" or "Liquid:mass"
<Case B-3>: Function == "Gas:STD/Normal"
<Case B-4>: Function == "Not use"

Simulation Setting value	Output value				
	Flow rate	Total flow rate	Process temperature	Process density	Contact output
Flow rate	Yes	Yes	No	No	Yes
Total flow rate	No	Yes	No	No	No
Process temperature	<Case B-1, 4> No	<Case B-1, 4> No	Yes	<Case B-1, 2> Yes	<Case B-1, 4> No
	<Case B-2, 3> Yes	<Case B-2, 3> Yes		<Case B-3, 4> No	<Case B-2, 3> Yes
Process density	<Case B-1, 3, 4> No	<Case B-1, 3, 4> No	No	Yes	<Case B-1, 3, 4> No
	<Case B-2> Yes	<Case B-2> Yes			<Case B-2> Yes
PV % Range	No	No	No	No	No
Loop Current	No	No	No	No	No

Simulation Setting value	Output value			
	PV= Instaneous flow rate		PV= Process temperature	
	PV % Range	Loop Current	PV % Range	Loop Current
Flow rate	Yes	Yes	<Case B-1, 2, 3> No	<Case B-1, 2, 3> No
			<Case B-4> Not available	<Case B-4> Not available
Total flow rate	No	No	<Case B-1, 2, 3> No	<Case B-1, 2, 3> No
			<Case B-4> Not available	<Case B-4> Not available
Process temperature	<Case B-1, 4> No	<Case B-1, 4> No	<Case B-1, 2, 3> Yes	<Case B-1, 2, 3> Yes
	<Case B-2, 3> Yes	<Case B-2, 3> Yes	<Case B-4> Not available	<Case B-4> Not available
Process density	<Case B-1, 3, 4> No	<Case B-1, 3, 4> No	<Case B-1, 2, 3> No	<Case B-1, 2, 3> No
	<Case B-2> Yes	<Case B-2> Yes	<Case B-4> Not available	<Case B-4> Not available
PV % Range	Yes	Yes	<Case B-1, 2, 3> Yes	<Case B-1, 2, 3> Yes
			<Case B-4> Not available	<Case B-4> Not available
Loop Current	No	Yes	<Case B-1, 2, 3> No	<Case B-1, 2, 3> Yes
			<Case B-4> Not available	<Case B-4> Not available

T081015.EPS

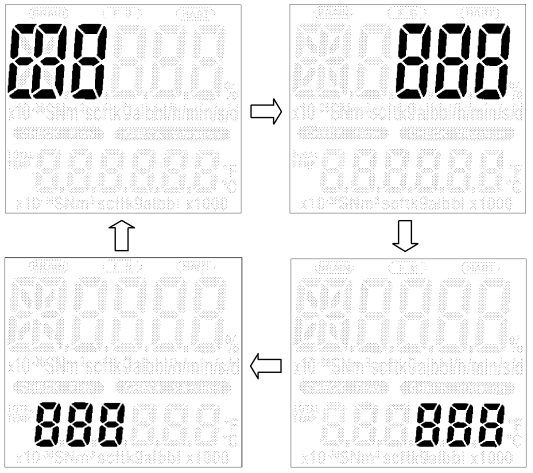
8.10.5.3 Squawk (Effective only when setting to HART 7)

This feature can be used to identify the communicating transmitter by remotely causing LCD to display the particular pattern as shown in the Figure 8.3

"SQUAWK" continues for approximately 10 seconds, then is released automatically.

• Procedure to call up the **Squawk** display

[Root Menu] → Diag/Service → Squawk(Method)



F081002.EPS

Figure 8.3 Display for Squawk

8.10.6 Switching HART Protocol Revision

When the output signal code is "-J", HART protocol revision of the device can be selectable from 5 or 7.
The HART protocol revision is set and shipped as specified in the order.
To change the HART protocol revision after shipment, follow the procedure shown below.

IMPORTANT

When change the protocol revision, confirm the items below.
- Protocol revision supported by HART configuration tool must be the same or higher than new protocol revision of the device. (Refer to 8.2)
- Confirm that the DD or DTM which is suitable to new protocol revision of the device is installed in the configuration tool. (Refer to Section 8.2 or 8.3)

1) Call up the parameter for protocol revision change
• Procedure to call up the **Chng universal rev** display.

DD (HART 5/7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Device information → Revision numbers → Chng universal rev
DTM (HART 5)	**[Root Menu]** → Configuration → HART → Chng universal rev

T081017.EPS

2) Activate the "Chng universal rev" method

IMPORTANT

The message is displayed to separate the device from the automatic control loop.
Confirm that the device is separated.

3) Input the new revision number
An input column for new protocol revision number is displayed. Input the new HART protocol revision number of "5" for HART 5 or "7" for HART 7.

It checks that the revision number which it is going to change into the Next universal rev column is displayed.

[Root Menu] → Detailed setup → Device information → Revision numbers → Next universal rev

4) Applying the new protocol revision
   a. Close the configuration tool
      After completion of Chng universal rev method, close the HART configuration tool.

NOTE

When using a FieldMate, close the main display of FieldMate.

   b. Restart the device
      Turn off the power to the device, and turn it on.

IMPORTANT

New protocol revision is applied only after having performed restart of the device.

NOTE

A new HART revision number is displayed on the integral indicator for three seconds after restart the device. (Refer to section 8.2)

5) Confirming the new protocol revision
   a. Restart the HART configuration tool

NOTE

When execute the other parameter confirmation or setting change, execute after restart the configuration tool.

b. Confirm the new HART protocol revision number

Call up the **Universal rev** parameter, and confirm that the new HART revision number is displayed.

• Procedure to call up the **Universal rev**. parameter.

DD (HART 5/7) DTM (HART 7)	**[Root Menu]** → Detailed setup → Device information → Revision numbers → Universal rev →
DTM (HART 5)	**[Root Menu]** → Configuration → HART → Universal rev. →
5	HART protocol revision: 5
7	HART protocol revision: 7

T081018.EPS

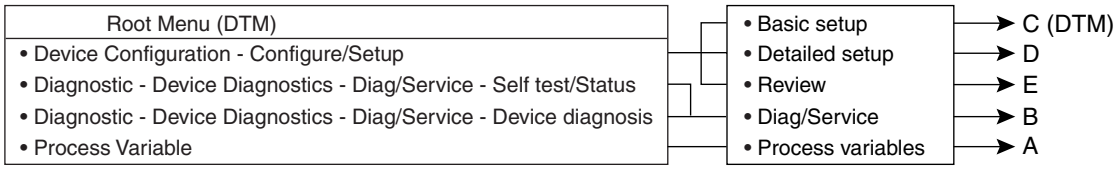
8.10.7 Other operations for the HART Configuration Tool

Regarding other operations for the HART Configuration Tool, refer to the HART Configuration Tool operations manual.

8.11 Menu Tree (HART 7)

■ DD

■ DTM



F081101.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal.
* Upload/Download

A

- Process variables
  - Flow rate [A20] (CR)
  - Total [A30] (CR)
  - Temp [A41] (CR)
  - %rnge [A10] (CR)
  - Loop Current (CR)
  - Device variable status
    - Flow rate Data Quality (CR) Data quality enum
    - Flow rate Limit Status (CR) Limit status enum
    - Total Data Quality (CR) Data quality enum
    - Total Limit Status (CR) Limit status enum
    - Temp Data Quality (CR) Data quality enum
    - Temp Limit Status (CR) Limit status enum
    - %rnge Data Quality (CR) Data quality enum
    - %rnge Limit Status (CR) Limit status enum
    - Loop Current Data Quality (CR) Data quality enum
    - Loop Current Limit Status (CR) Limit status enum
  - Time Stamp (CR)

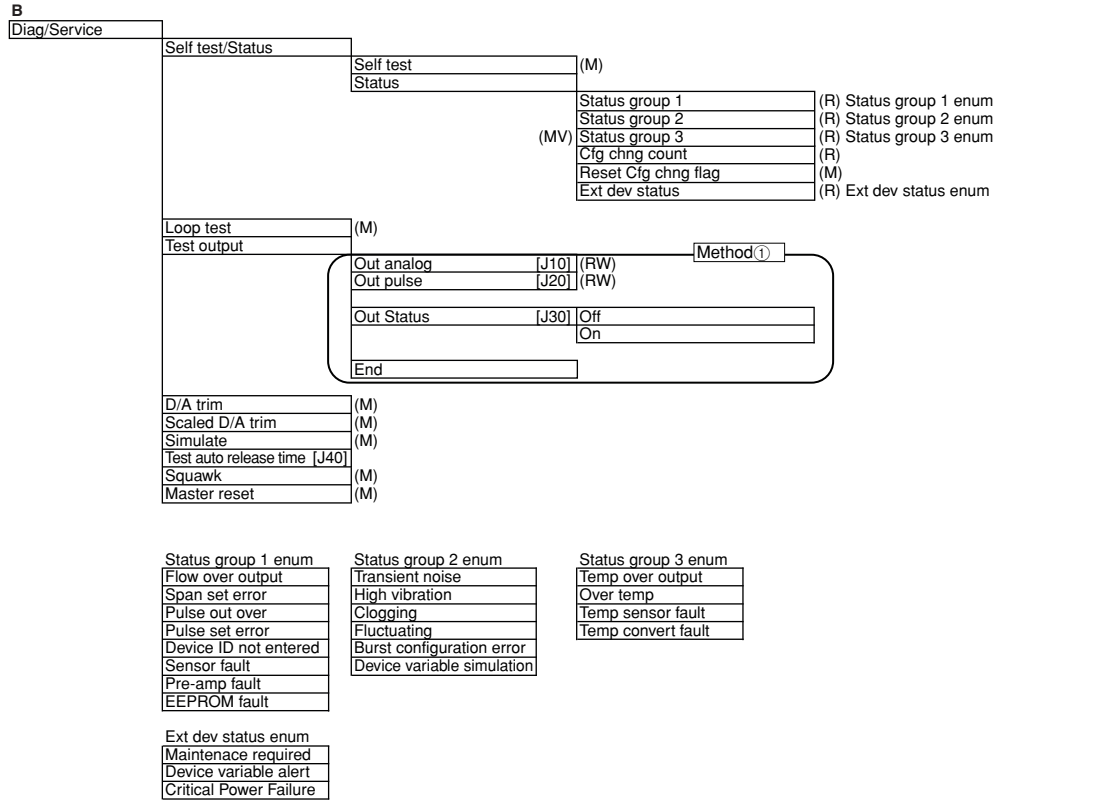
Data quality enum
Bad
Poor accuracy
Manual / Fixed
Good

Limit status enum
Not limited
Low limited
High limited
Constant

F081102.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal.
* Upload/Download



Status group 1 enum
- Flow over output
- Span set error
- Pulse out over
- Pulse set error
- Device ID not entered
- Sensor fault
- Pre-amp fault
- EEPROM fault

Status group 2 enum
- Transient noise
- High vibration
- Clogging
- Fluctuating
- Burst configuration error
- Device variable simulation

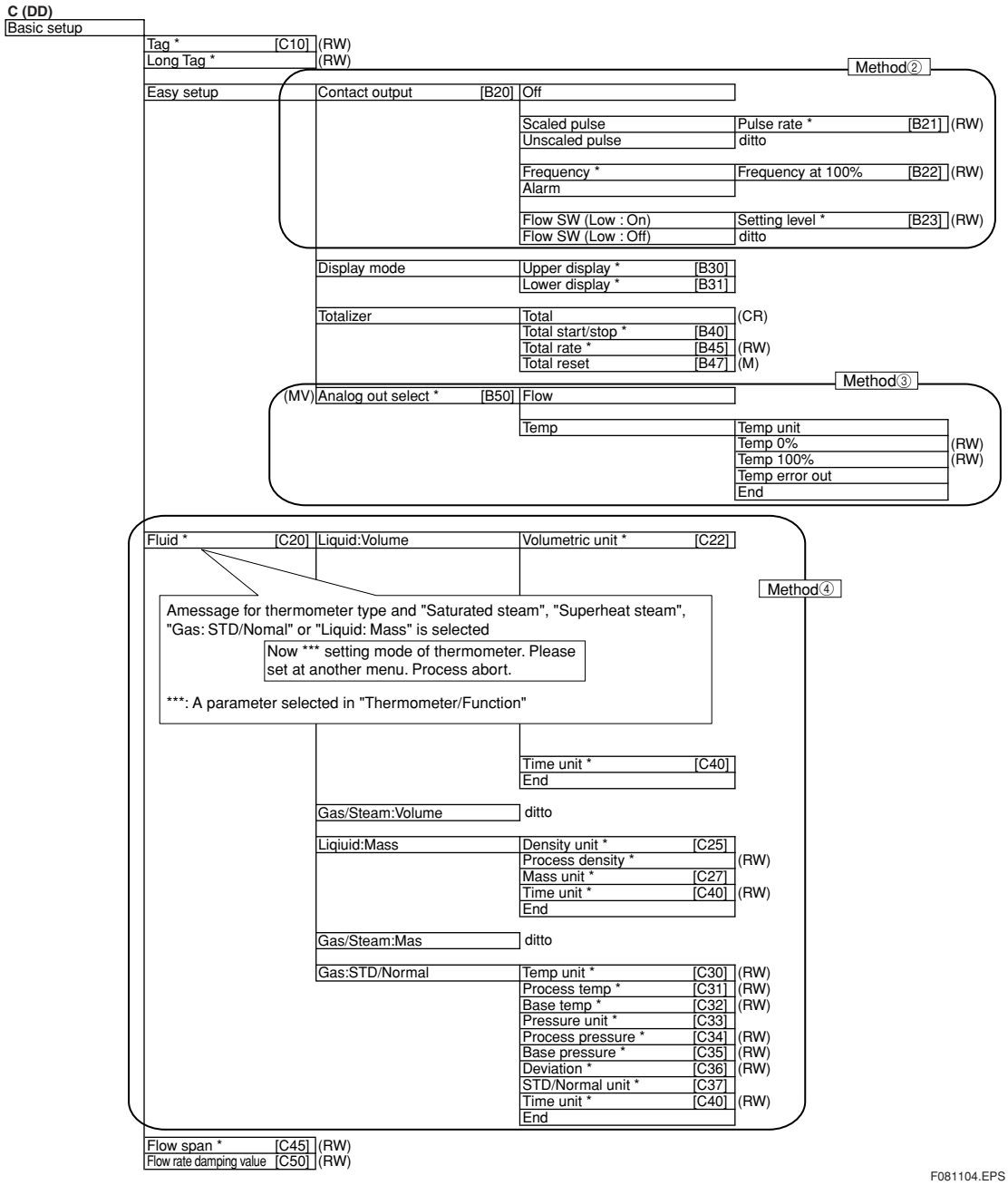
Status group 3 enum
- Temp over output
- Over temp
- Temp sensor fault
- Temp convert fault

Ext dev status enum
- Maintenace required
- Device variable alert
- Critical Power Failure

F081103.EPS

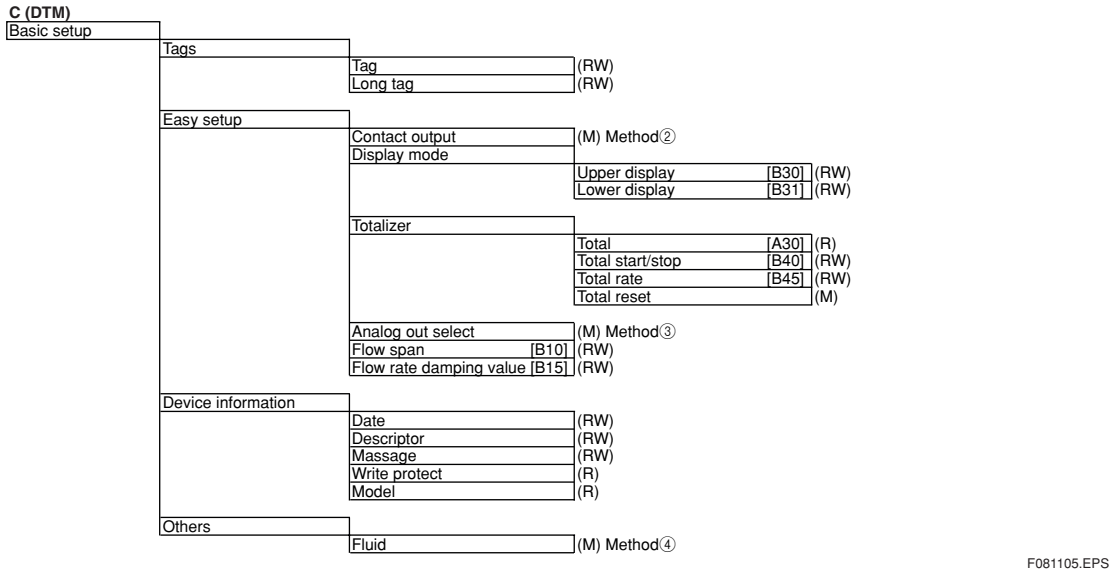
(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal.
* Upload/Download



F081104.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type



F081105.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal.
* Upload/Download

D

- Detailed setup
  - Characterize meter
    - Nominal size * [E10] (RW)
    - Body type * [E20] (RW)
    - Sensor type * [E30] (RW)
    - K-factor setup
      - K-factor unit * [E40] (RW)
      - K-factor * [E41] (RW)
    - Detector No. * [E50] (RW)
  - Flow rate units
    - Fluid * [C20] (M): Method④
    - Method⑤
      - Special unit [D40]
        - No
        - Yes
          - Base unit * (R)
          - User's unit * (RW)
          - Conversion factor * (RW)
          - End
        - Special
          - Base unit * (R)
          - User's unit * (RW)
          - Conversion factor * (RW)
          - End
  - Configure outputs
    - Analog outputs
      - Flow span * [B10] (RW)
      - Out limit(H) * [D30] (RW)
      - Burn out [D35] (R)
      - Loop current mode (RW) Loop current mode enum
      - Channel flags (R)
    - Contact output * (M)
    - Display mode
      - Upper display [B30] (RW)
      - Lower display [B31] (RW)
    - Totalizer
      - Total [A30] (CR)
      - Total start/stop [B40] (RW)
      - Total rate [B45] (RW)
      - Total reset [B47] (M)
    - HART output
      - Poll addr (RW)
      - Loop current mode (RW) Loop current mode enum
      - Num req preams (R)
      - Num resp preams (RW)
      - Burst condition
        - Burst message 1
          - Burst mode (RW) Burst mode enum
          - Burst command (RW) Burst command enum
          - Burst device variables (RW) Burst device variables enum
          - Set Burst Trigger (M)
          - Set Burst Period (M)
          - Burst trigger mode (R)
          - Burst trigger level (R)
          - Update period (R) Update period enum
          - Max update period (R) Update period enum
        - Burst message 2 ditto
        - Burst message 3 ditto

To be continued to next page (D1)

Loop current mode enum

Disabled
Enabled

Burst mode enum

Off
Wired HART Enabled

Burst command enum

Cmd 1 : PV
Cmd 2 : % range/current
Cmd 3 : Dyn vars/current
Cmd 9 : Device vars w/ status
Cmd 33: Device variables
Cmd 48 : Read Additional Device Status

Burst device variables enum

Burst variable code
Burst variable code
Burst variable code
Burst variable code
Burst variable code
Burst variable code
Burst variable code
Burst variable code

Update period enum

0.5 s
1 s
2 s
4 s
8 s
16 s
32 s
1 min
5 min
10 min
15 min
30 min
45 min
60 min

F081105_1.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal.
* Upload/Download

D1

- Event notification
  - Event notification control
  - Event mask
    - Device Status Mask
    - Status group 1 — (RW) Status group 1 enum
    - Status group 2 — (RW) Status group 2 enum
    - Status group 3 — (RW) Status group 3 enum
    - Ext dev status Mask — (RW) Ext dev status enum
    - Device Diagnostic Status 0 Mask — (RW) Device Diagnostic Status 0 Mask
  - Set event notification timing — (M)
  - Event notification retry time — (R) Update period enum
  - Max update time — (R) Update period enum
  - Event debounce interval — (R)
  - Knowledge
    - Acknowledge event notification — (M)
    - Event Status — (R)
    - Event Number — (R)
    - Time first unack event triggered — (R)
    - Latched Cfg chng count — (R)
    - Latched Device Status — (R)
    - Status group 1 — (R) Status group 1 enum
    - Status group 2 — (R) Status group 2 enum
    - (MV) Status group 3 — (R) Status group 3 enum
    - Latched Ext dev status — (R) Ext dev status enum
    - Latched Device Diagnostic Status S — (R) Device Diagnostic Status 0 Mask
- Flow rate Update time period — (R)
- Total Update time period — (R)
- Temperature Update time period — (R)
- Density Update time period — (R)
- Dynamic variable assignment
  - PV is — (R) PV assign enum
  - SV is — (R) Dyn var assign enum
  - TV is — (R) Dyn var assign enum
  - QV is — (R) Dyn var assign enum
  - (MV) Chng dyn var assign — (M) Dyn var assign enum

To be continued to next page (D2)

Device Diagnostic Status 0 Mask

Simulation active
Non-Volatile memory failure
Volatile memory error
Watchdog reset executed
Voltage conditions out of range
Environmental conditions out of range
Electronic failure

PV assign enum

Flow rate
Temperature

Dyn var assign enum

Flow rate
Total
Temperature
Density

F081105_2.EPS

(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal.
* Upload/Download

D2

- Signal processing
  - Flow rate damping value [B15] (RW)
  - Low cut * [D10] (RW)
  - Temp setup
    - Temp unit [D20] (RW)
    - Process temp [D21] (RW)
  - Density setup
    - Density unit [D25] (RW)
    - Process density [D26] (RW)
  - Maintenance
    - TLA * [K10] (RW)
    - Signal level * [K20] (RW)
    - Method⑥
      - Noise balance mode * [K25]
        - Auto (RW)
        - Manual
          - Set noise ratio (RW)
          - End
        - Tuning at zero flow
    - Noise ratio * [K26] (CR)
    - Maintenance data
      - Velocity [K30] (CR)
      - Span velocity [K32] (CR)
      - Vortex frequency [K34] (CR)
      - Span frequency [K36] (CR)
      - (MV) Density [K38] (CR)
    - Error record [K40]
      - Err record reset (M)
      - Er record status 1 (CR) Er record status 1 enum
      - Er record status 2 (CR) Er record status 2 enum
      - (MV) Er record status 3 (CR) Status group 3 enum
    - High vibration * [K45] (RW)
    - Method⑦
      - Amplifier check
        - Set vortex frequency [K28] (RW)
        - End
    - Menu type number (RW)
    - Menu type (R)
  - Adjust
    - User adjust * [H20] (RW)
    - Method⑧
      - Reynolds adjust * [H25]
        - Not active
        - Active
          - Process density (RW)
          - Viscosity * (RW)
          - End
    - Gas expansion fact * [H30]
      - Not active (RW)
      - Active (RW)
    - Method⑨
      - Flow adjust * [H40]
        - Not active
        - Active
          - Set point 1-data * (RW)
          - Set point 2-data * (RW)
          - Set point 3-data * (RW)
          - Set point 4-data * (RW)
          - Set point 5-data * (RW)
          - End

To be continued to next page (D3)

Er record status 1 enum

Flow over output
Span set error
Pulse out over
Pulse set error
Sensor fault
Pre-amp fault
EEPROM fault

Er record status 2 enum

Transient noise
High vibraton
Clogging
Fluctuating

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(R) Read only
(CR) Continuous read
(RW) Read and Write
(M) Method of HCF
Unique Method of DY
(MV) Only for Thermometer Type

[ ] Parameter No. in display and BRAIN Terminal.
* Upload/Download

D3

- Device information
  - Manufacturer (R)
  - Tag * (RW)
  - Long tag * (RW)
  - Descriptor * (RW)
  - Message * (RW)
  - Date * (RW)
  - Write protect (R)
  - Revision numbers
    - Universal rev (R)
    - Fld dev rev (R)
    - Software rev (R)
    - Hardware rev (R)
    - Final asmbly num (R)
    - Dev id (R)
    - Next universal rev (R)
    - Chng universal rev (M)
  - Max dev vars (R)
  - Device profile (R) Device profile enum
  - Flow rate Update time period (R)
  - Country (RW) Country enum
- (MV) Thermometer
  - Function — Method⑩
    - Monitor only
    - Saturated steam
      - Mass unit [F12] (RW)
      - Time unit [F35] (RW)
      - End
    - Superheat steam
      - Pressure unit [F14] (RW) Pressure unit enum
      - Process pressure [F15] (RW)
      - Mass unit [F16] (RW)
      - Time unit [F35] (RW)
      - End
    - Gas:STD/Normal
      - Temp unit [F18] (RW)
      - Base temp [F19] (RW)
      - Pressure unit [F20] (RW) Pressure unit enum
      - Process pressure [F21] (RW)
      - Base pressure [F22] (RW)
      - Deviation [F23] (RW)
      - STD/Normal unit [F24] (RW)
      - Time unit [F35] (RW)
      - End
    - Liquid:Mass
      - Density unit [F26] (RW)
      - Base density * [F27] (RW)
      - Temp unit [F28] (RW)
      - Base temp [F29] (RW)
      - 1'st temp coeff * [F30] (RW)
      - 2'nd temp coeff * [F31] (RW)
      - Mass unit [F32] (RW)
      - Time unit [F35] (RW)
      - End
    - Not use
  - Cable length * [F52] (RW)
  - Temp damping * [F50] (RW)
  - Analog out select * [F55] (M): Method③

E

- Review
  - Review 1
  - Review 2
  - Review 3
- (MV) Review 4

Device profile enum

Process automation device
Discrete device

Country enum

0x5553 "US"
0x4a50 "JP"
0x4445 "DE"
0x4652 "FR"
0x4553 "ES"
0x5255 "RU"
0x434e "CN"

Pressure unit enum

MPa abs
kPa abs
kg/Sqcm abs
bar abs
psia

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Review 1	Review 2	Review 3	Review 4
Model	Flow rate unit	Special unit	Function
Manufacturer	Flow span	User's unit	Base density
Distributor	Flow rate damping value	Conversion factor	1'st temp coeff
Cfg chng count	Contact output	Nominal size	2'nd temp coeff
Max dev vars	Pulse rate	Body type	Cable length
Tag	Frequency at 100%	Sensor type	Temp damping
Long tag	Setting level	K-factor	Analog out select
Descriptor	Upper display	Detector No	Temp 0%
Message	Lower display	User adjust	Temp 100%
Date	Total rate	Reynolds adjust	Temp error out
Dev id	Total start/stop	Viscosity	(Only for /MV)
Write protect	Fluid	Gas expansion fact	
AO Alrm typ	Process density	Flow adjust	
Universal rev	Process temp	TLA	
Fld dev rev	Base temp	Signal level	
Software rev	Process pressure	Noise balance mode	
Hardware rev	Base pressure	Noise ratio	
Poll addr	Deviation	High vib.	
Loop current mode	Low cut	Span velocity	
Num req preams	Out limit (H)	Span frequency	
Num resp preams	Burn out		

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9. OPERATION

After you have installed the flowmeter into the process piping, wired the input/output terminals, set up the required parameters, the vortex flowmeter should output an accurate flow signal from its terminals as soon as the measured liquid begins to flow.

This section describes procedure of test method and adjustment method for the pre-operation.

NOTE

The initial parameter setting has already been done at the factory according to the sizing data when ordering. Therefore it is not necessary to set parameters except measurement condition changes or some additions happen.

9.1 Adjustment

9.1.1 Zero Adjustment

No zero adjustment is necessary since the zero point does not shift.

Because of the effect of electrical noise and vibration noise, digitalYEWFLO may provide an output even when the flowrate is zero. In that case, properly eliminate the source of the noise.

Refer to “9.2 : Adjustment for manual mode”.

9.1.2 Span Adjustment

In normal application, you need not confirm the span.

If you need to ensure the output of 4 to 20mA DC, refer to “9.1.3 Loop Test”.

9.1.3 Loop test

To ensure output of 4 to 20mA DC or pulse, their loop tests can be done using parameter “J10 (Analog out)” or “J20 (Pulse test)”.

If you are verifying the analog output, follow the procedure on the verification procedure.

<Check Procedure>

1. Connect the instruments referring to Figure 9.1, and warm up for three minutes more.
2. Set span frequency in Parameter J10:OUT ANALOG.
3. In case the load resistance is 250 ohm, digital multimeter indicates 5V. Otherwise if it is known load resistance value, it indicates R (Ω) × 0.02 (A).
4. Check output value is in the rated value (±0.016 mA) after set 50% in Parameter J10.
5. Check output value is in the rated value (±0.016 mA) after set 0% in Parameter J10.

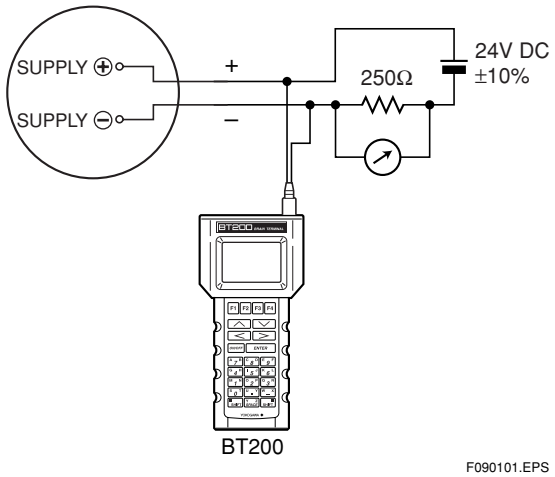

Figure 9.1 Connection of Maintenance Instruments

IMPORTANT

- When using any test-purpose measuring instruments, do not ground them.
- All of your parameter settings will be cancelled if you turn digitalYEWFLO off less than 30 seconds after the parameter setup. Keep digitalYEWFLO turned on at least 30 seconds after setting up the parameters.

NOTE

When configure the parameters using the HART Configuration Tool, refer to 7.12 Menu Tree (HART 5) or 8.11 Menu Tree and 8.10.5.1 Loop Test (HART 7).

9.1.4 Totalizer Function Start and Totalized Value Reset

When using the Totalizer Function, the start setup should be done.

(1) Start operation using BT200
Enter to B40(TOTAL START), and move the video bar to “EXECUTE”. Push “ENTER” key at 2 times.
(2) Start operation using indicator
Enter to “Setting mode”, move to B40 of parameter number, and enter to “01” of data number.
Refer to “4.4: Setting mode”.

Totalized value can be reset using the indicator or BT200.

(1) Reset operation using BT200
Enter to B42 (TOTAL RESET), and move the video bar to “EXECUTE”. Push “ENTER” key at 2 times.
(2) Reset operation using indicator
Enter to “Setting mode”, move to B42 of parameter number, and enter to “01” of data Number.
Refer to “4.4 : Setting mode”.

9.1.5 Unit of Pulse Output (Scaling)

Pulse output are constructed by two units, that are “Scaled pulse and Unscaled Pulse”.

(1) Scaled Pulse

When SCALED PULSE is selected in B20, set flowrate per one pulse output. Rate unit is linking to the flow unit.

(2) Unscaled Pulse

When UNSCALED PULSE is selected in B20, it outputs the pulse calculated by following formula.

The formula for output pulse number is as follows.

Output pulse number per one second = vortex number per one second / PULSE RATE set number.

Refer to 10.6 (1) Flow calculation.

● Pulse Rate setting

Pulse rate setting is settable by “B21:PULSE RATE”.

9.1.6 Setting of Burnout Switch

digitalYEWFLO is equipped with a CPU error burnout function used to set the output direction upon CPU error, and a sensor burnout function that sets the direction of the output in the event of burnout of the temperature sensor. When factory-shipment under normal conditions, the output of both CPU error burnout and sensor burnout are set to HIGH, but if suffix code/C1 is specified, the CPU error burnout is set to LOW(-2.5% below) output, and sensor burnout is set to LOW(-2.5% below) output, respectively. The setting of the direction of output from burnout can be changed.

To change the direction of output arising from burnout, switch the setting pin on the CPU assembly (see Table 9.1).

Table 9.1 Output Setting Pin for Burnout

Pin position	CPU error burnout direction	CPU error burnout output	Remark
H / L	HIGH	110% or more (21.6mA DC)	Set to HIGH before shipment.
H / L	LOW	-2.5% or less (3.6mA DC)	Set to LOW for option specification code / C1.

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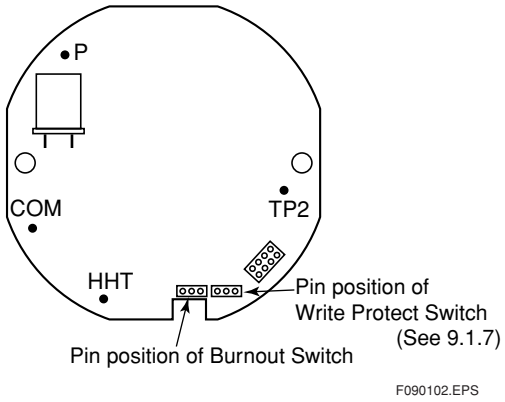

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Figure 9.2 Pin position of Burnout and Write Protect Switch

9.1.7 Setting of Write Protect Switch

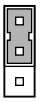
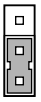
By setting the write protect function to “Protect”, it is possible to prevent the overwriting of parameters. Write protection can be carried out using either the hardware switch on the CPU board (i.e., Switch 2) or software parameter settings. If either of these items is set to “Protect”, the overwriting of parameters will be prohibited.

NOTE

If the hardware switch is set to “Protect”, it will not be possible to overwrite parameters; furthermore, this condition will be maintained until the switch is set to “Enable”.

For more details regarding usage of the write protect function and the software's parameter switches, refer to 7.9 Software Write Protect (HART 5) or 8.9 Software Write Protect (HART 7).

Table 9.3 Setting pin for Write Protect

Pin position	CPU error burnout direction
	Enable
	Protect

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9.1.8 Power Failure

When a power failure occurs, the totalized value will be protected by EEPROM (Electrically Erasable Programmable ROM). But during a power failure, the vortex flowmeter stops and also the totalizing will stop.

After a power is recovered, the vortex flowmeter and the totalizing start to work automatically.

EEPROM doesn't need a battery for backup.

9.2 Adjustment for Manual Mode

digitalYEWFLO does not need the initial adjustment because digitalYEWFLO is always adjusted by itself automatically.

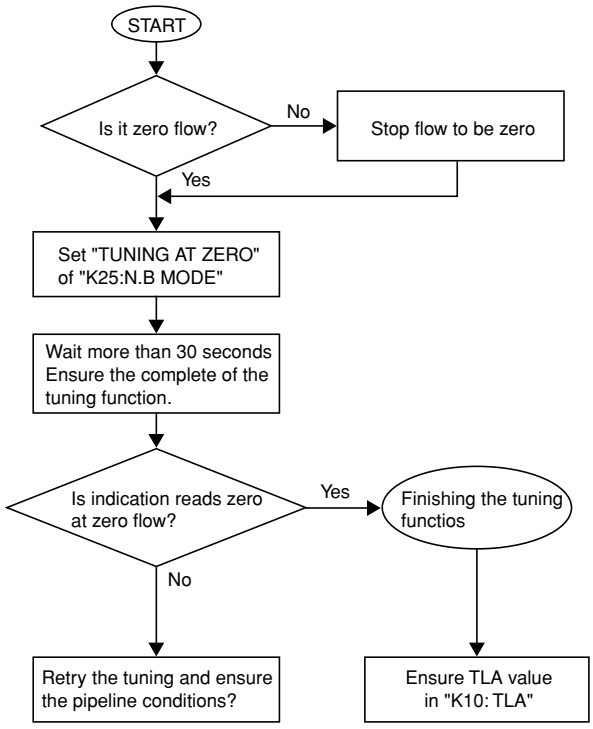
These adjustments should be done in case that indicator reads over zero at zero flow.

9.2.1 Low Cut Adjustment

Adjust to noise elimination or zero flow in the low flowrate (or low frequency) range.
The settable range for low cut flowrate is to half of minimum flowrate.

9.2.2 Zero Tuning

This adjustment should be done according to a flow figure shown below.


START
Is it zero flow?
No
Stop flow to be zero
Yes
Set "TUNING AT ZERO" of "K25:N.B MODE"
Wait more than 30 seconds Ensure the complete of the tuning function.
Is indication reads zero at zero flow?
Yes
Finishing the tuning functios
No
Retry the tuning and ensure the pipeline conditions?
Ensure TLA value in "K10: TLA"

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If this adjustment is executed, the following value is changed.

K25:N.B MODE = MANUAL

K26:NOISE RATIO=Constant value

Minimum flowrate is increased when TLA value is changed form initial value.

1. Tuning method

(1) Ensure the condition of flowrate
The necessary condition for tuning function is zero flow.

(2) Executing the tuning function.
Set " TUNING AT ZERO" of "K25:N.B MODE".
Wait more 30 second.

(3) Finishing the tuning functions
Using the BT200
(a) Press "DATA" key of BT200 function key.
(b) Ensure the indication of "MANUAL" which is "K25:N.B MODE"
("NOW TUNING" is indicated during tuning operation.)
Using the indicator
(a) Press "SHIFT" and "SET" key simultaneously.
(b) Press "SET" key and ensure "01" of Lower indication.
("02" is indicated during tuning operation. Execute (a), (b) once again.)

2. TLA value

TLA values is possible to change after executing "TUNING". In this case, minimum flowrate is increased.

Minimum flowrate for TLA value is given by below equation.

$$\text{Minimum Flowrate after changing TLA Value} = \text{Specified Minimum Flowrate} \times \sqrt{\frac{\text{TLA Value after Tuning}}{\text{TLA initial value or defalt value}}}$$

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Ensure minimum flowrate for changing TLA value.

3. Output

After tuning, ensure that the indication reads is zero where no fluid is flowing.

If the indication reads over zero is done continuously, retry the tuning and ensure the below condition.

Does high vibrations occur in pipeline?

In this case, refer to "2:INSTALLATION", and keep the pipeline properly.

9.3 Other Maintenance

9.3.1 Cleaning Precautions

Care should be taken to prevent the build up of dirt, dust or other material on the display glass and data plate. In case of its maintenance, soft and dry cloth is used.

10. MAINTENANCE

CAUTION

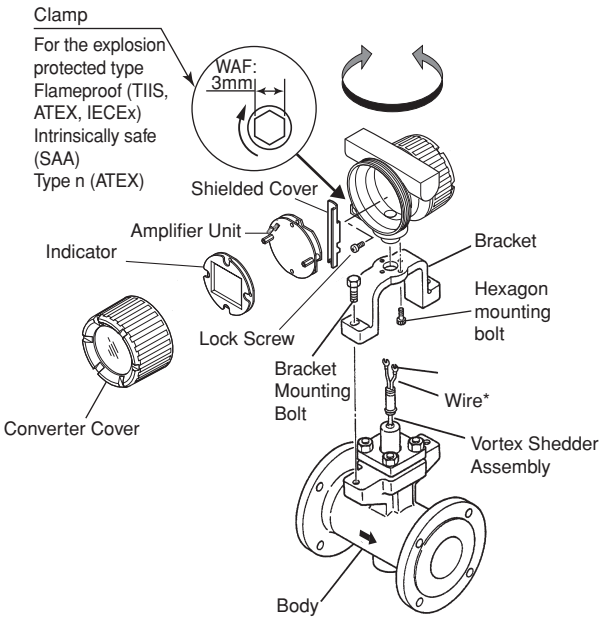
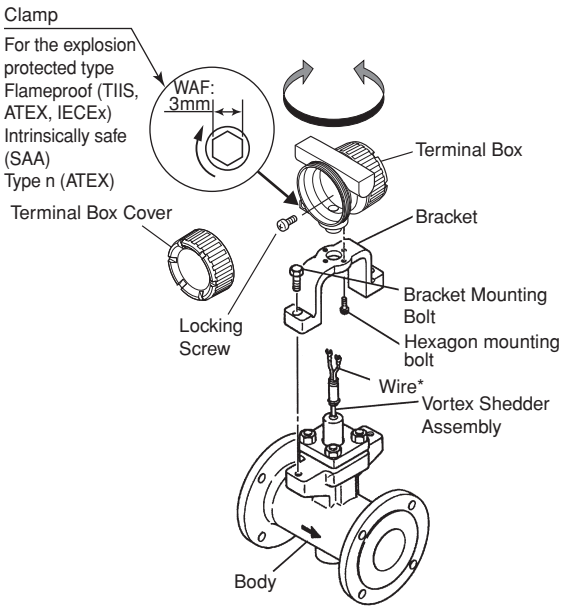
- Disassemble work should be done only for error occurrence.
- Maintenance work must be carried out by expert engineer or skilled personnel and not by operators.
- Before opening the cover, it is important to ensure that at least 10 minutes have passed since the power was turned off. Furthermore, opening of the cover must also be carried out by expert engineer or skilled personnel.

CAUTION

- It is prohibited by law for the user to modify flameproof instruments. It is not permitted to add or remove indicators. If modification is required, contact YOKOGAWA.
- Explosion protected type must be, as a rule, removed to a non-hazardous area for maintenance and be disassembled and reassembled to the original state.
- For TIIS, ATEX and SAA explosion proof, the display cover is locked by the clamp. In case of opening the display cover, use the hexagonal wrench attached.
- Be sure to lock the cover by the clamp using the hexagonal wrench attached after installing the cover.

10.1 Changing the Terminal Box Orientation

The terminal box can be changed in four directions with respect to the flow direction.

Integral Type Vortex Flowmeter	Remote Type Vortex Flowmeter
<1> Remove the converter cover. In case of the explosion proof type cover removal, loosen the clamp (WAF: 3mm). <2> For indicator and amplifier unit removal, refer to paragraph 10.2 and 10.4. <3> Disconnect the vortex shedder assembly lead-wires from the converter. In case of the explosion proof type, loosen the lock screw (WAF: 1.5mm). <4> Remove the bracket mounting bolts and remove the converter and bracket from the flowmeter body. The bracket applies to the 1 (25mm) to 4 (100mm) inch flowmeters. <5> Remove the hexagon mounting bolts in case of 90-degree turn. <6> Turn the converter to the desired orientation. When reassembling the converter, reverse the above procedure.	<1> Remove the terminal box cover. In case of the explosion proof type cover removal, loosen the clamp (WAF: 3mm). <2> Disconnect the vortex shedder assembly lead-wires from the terminal box. In case of the explosion proof type, loosen the lock screw (WAF: 1.5mm). <3> Remove the bracket mounting bolts and remove the terminal box and bracket from the flowmeter body. The bracket applies to the 1 (25mm) to 4 (100mm) inch flowmeters. <4> Remove the hexagon mounting bolts in case of 90-degree turn. <5> Turn the terminal box to the desired orientation. When reassembling the terminal box, reverse the above procedure.
	

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10.2 Indicator Removal and Rotation

(1) Turn the power OFF.
(2) Remove the cover.
    * In case of the Explosion protected type, remove the cover after unlock the clamp.
(3) For the indicator, disconnect the cable connector from the amplifier unit.
(4) Loosen the two indicator mounting screws using a Phillips screwdriver.
(5) Pull out the indicator.
(6) Reinstall the indicator in the reverse order to its removal (above) and secure the mounting screws.

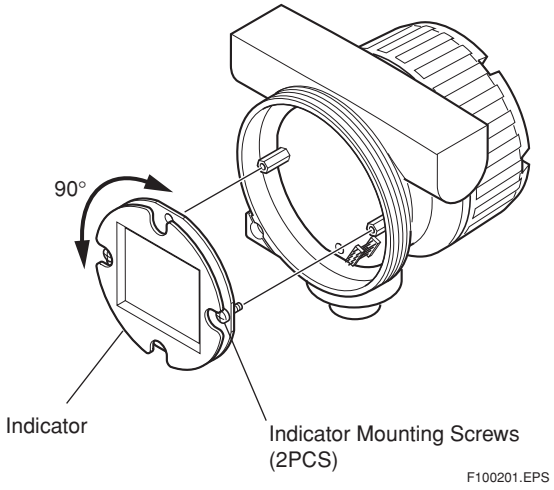

Figure 10.1 Removing and Reinstalling the Indicator

10.3 Amplifier Unit Removal

IMPORTANT

Do not turn the amplifier unit for removal or assembling. The connector pins may be damaged.

(1) Turn the power OFF.
(2) Remove the converter cover.
    * In case of the Explosion protected type, remove the cover after unlock the clamp.
(3) Remove the indicator according to the procedures described in paragraph 10.2.
(4) Loosen the terminal screws and remove the amplifier unit.

10.4 Amplifier Unit Assembling

IMPORTANT

The amplifier unit must be assembled keeping the procedure as follows. Amplifier may not operate normally when the procedure does not keep.

(1) Put two-mounting pins① into mounting hole②.
(2) Push the head of two mounting screws④ lightly.
(3) Push head of two IC⑤ and mount the amplifier unit③.
(4) Tighten two mounting screws④.

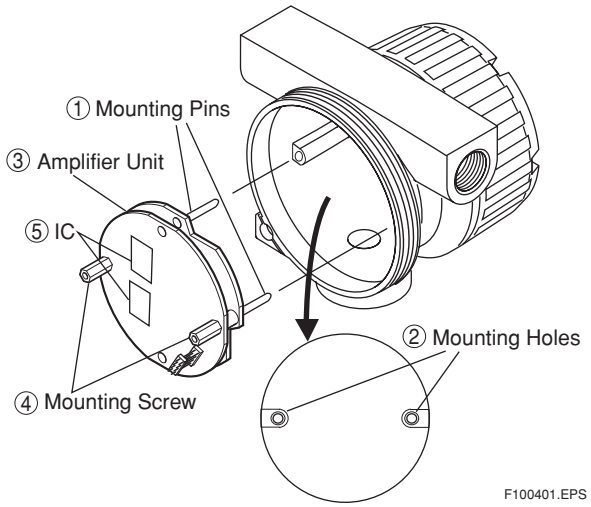

Figure 10.2 Removing and Reinstalling the Amplifier Unit

10.5 Vortex Shedder Removal

CAUTION

- Disassemble work should be done only for error occurrence.
- Only expert engineer or skilled personnel are permitted to open the cover.
- When the vortex shedder is disassembled, and empty the flow tube before the gasket must be replaced with a new one.
- Output error may cause when the shedder bar is not restored correctly.
- For Explosion proof type, move vortex flowmeter to non-hazardous area firstly, then do the assemble work.

(1) For nominal size 15mm to 100mm (1 inch to 4 inch), remove the converter cover or terminal box according to the following (2) to (5). For nominal size 150mm to 300 (6 inch to 12 inch), this procedure is not necessary.

(2) For integral type, remove the converter cover. For remote type, remove the terminal cover. For integral type, loosen the hexagonal screw on the Amplifier unit, then remove the amplifier unit. Remove the indicator first, in case the device has it.

(3) For integral type, remove the Shielded cover back Amplifier unit. In case of following Explosion proof type, loosen the locking screw on the converter case or terminal box.
Explosion proof type: TIIS Flame proof, ATEX Explosion proof, SAA Flame proof

(4) Remove the Leadwire by loosening a screw on the terminal strip.

(5) Loosen the bracket mounting bolts and remove the converter case or terminal box together with the bracket. Be careful not to damage the leadwires of the vortex shedder assembly.

(6) Loosen the vortex shedder assembly mounting bolts (2 to 6 pcs) and remove the vortex shedder assembly.

(7) When reassembling the vortex shedder assembly, reverse above procedure. Confirm the following.
   a. Replace to a new gasket.
   b. The guide pin on the vortex shedder mounting block meets the guide pin hole. See Figure 10.3. Nominal size 150mm to 300mm (6inch to 12inch) has no guide pin.
   c. The vortex shedder assembly is installed as illustrated in Figure 10.3.
   d. Tighten the sensor mounting bolts uniformly and diagonally in three or four times. See Figure 10.4.

Table 10.1 Torque Value

Nominal Size mm (inch)		Torque Value UNIT: N·m		
		Standard, /NC, /LT	High Temperature (/HT)	
			A	B
15 (1/2)		16		
25 (1)		12	18	12
40 (1-1/2)		12	18	12
50 (2)		18	27	18
80 (3)		32	48	32
100 (4)		49	74	49
150 (6)	Shedder bar “L”, “X”	49	69	49
	Shedder bar “B”	60	90	60
200 (8)		69	98	69
250 (10)		157	210	140
300 (12)		157	210	140

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In case of High Temperature Version (Option code: HT), First time tighten Nuts with a torque wrench, applying the torque specified “A”.

Next time loosen Nuts completely, then again tighten Nuts with a torque wrench, applying the torque specified “B”.

   e. Insert the leadwires (vortex shedder) through the terminal box bottom hole and lower the terminal box slowly until the bracket touches the flowmeter shoulder. Be sure to keep the leadwires vertical while lowering the terminal box.
   f. After assembling, confirm that there is no leakage from the vortex flowmeter.

IMPORTANT

Please tighten the screws/bolts uniformly and observing the torque value in Table 10.1.

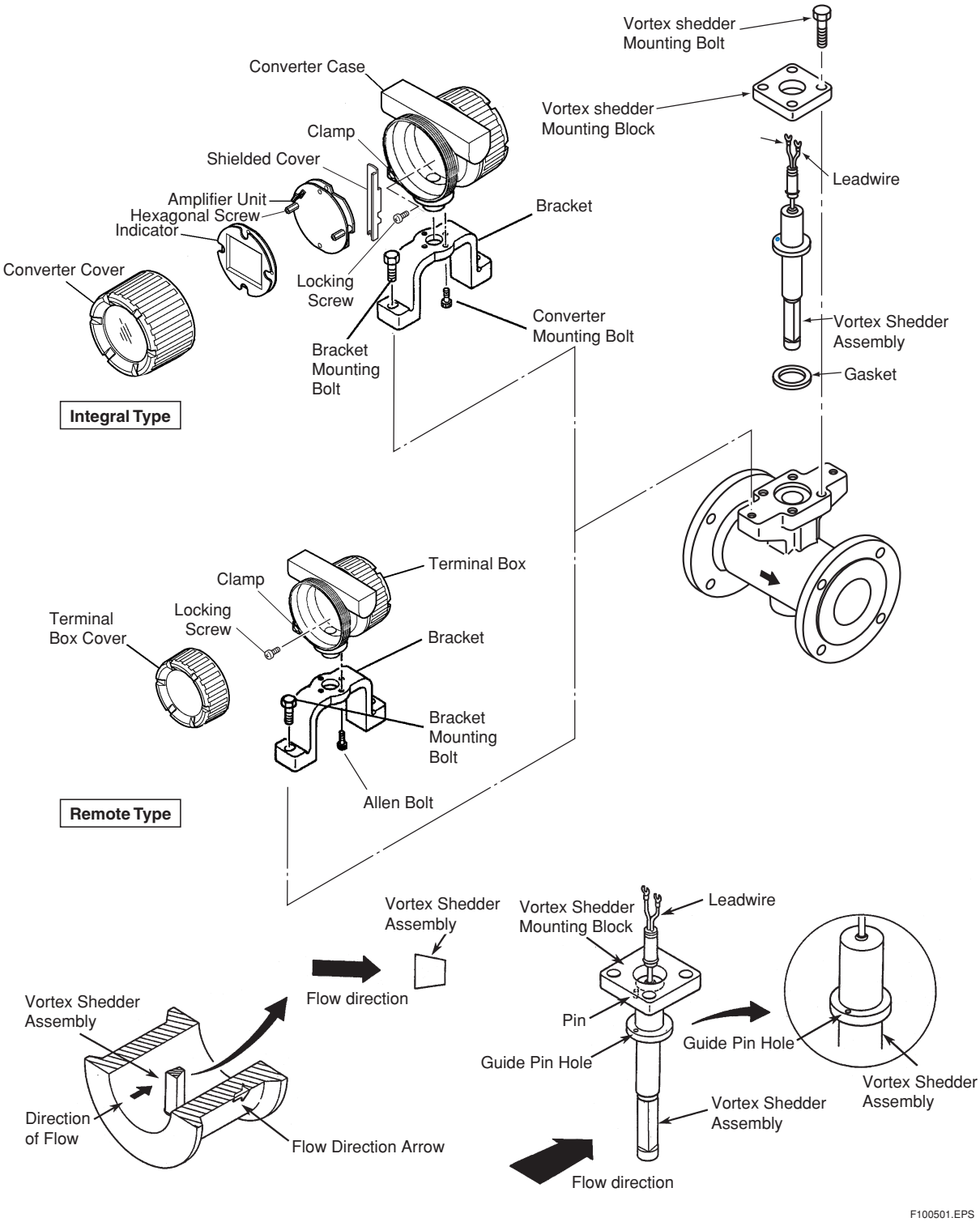


Figure 10.3 Disassembling and Reassembling the Vortex Shedder Assembly

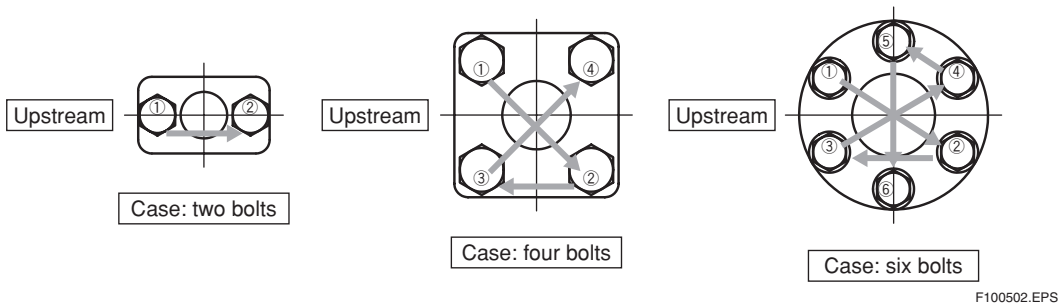


Figure 10.4 Procedure of tightening bolts

10.6 Flow Calculation

(1) Flow Calculation

The flowrate is calculated with the following equations based on the N number of generated vortices:

(a) Flowrate (in engineering units)

$$RATE=N\times\frac{1}{\triangle t}\times\varepsilon_f\times\varepsilon_e\times\varepsilon_r\times\frac{1}{KT}\times U_k\times U_{TM}$$

.... (10.1.1)

$$KT=KM\times U_{KT}\times\{1-4.81\times(Tf-15)\times10^{-5}\}$$ .... (Metric Units) .... (10.1.2)

$$KT=KM\times\{1-2.627\times(Tf-59)\times10^{-5}\}$$ .... (English Units) .... (10.1.3)

(b) Flowrate (%)

$$RATE(\%)=RATE\times\frac{1}{F_S}$$ .... (10.2)

(c) Totalized value

$$TOTAL=TOTAL+\triangle TOTAL$$

$$\triangle TOTAL=RATE\times\triangle t\times\frac{1}{T_R}\times\frac{1}{U_{TM}}$$ .... (10.3)

(d) Pulse output frequency

$$PULSE\ FREQ=RATE\times\frac{1}{P_R}\times\frac{1}{U_{TM}}$$ .... (10.4.1)

$$PULSE\ FREQ=N\times\frac{1}{\triangle t}\times\frac{1}{P_R}$$ .... (Unscaled pulses) .... (10.4.2)

(e) Velocity

$$V=N\times\frac{1}{\triangle t}\times\frac{1}{KT}\times U_{KT}\times\frac{4}{\pi D^2}$$ .... (10.5)

(f) Reynolds number

$$Re=V\times D\times\rho_f\times\frac{1}{\mu}\times1000$$ .... (Metric Units) .... (10.6.1)

$$Re=V\times D\times\rho_f\times\frac{1}{\mu}\times124$$ .... (English Units) .... (10.6.2)

where N: Number of input pulses (pulse)
Δt: Time corresponding to N (seconds)
ε_f: Instrumental error correction factor
ε_e: Expansion correction factor for compressive fluid
ε_r: Reynolds number correction factor
KT: K-factor at operating conditions (pulses/litre) (pulse/gal)
KM: K-factor at temperature 15°C (59°F)
U_{KT}: Unit conversion factor for K-factor
U_k: Flow unit conversion factor (Refer to item (2))
U_k(user): Flow unit conversion factor for user's unit
U_{TM}: Factor corresponding to flow unit time (ex./m (minute) is 60.)
P_R: Pulse rate (ex. E+ 3 is 10^3.)
T_f: Temperature at operating conditions (°C) (°F)
F_S: Flowrate span
T_R: Total rate
D: Internal diameter (m) (inch)
μ : Viscosity (mPa • s(cP))
ρ_f: Density at operating conditions (kg/m³) (ℓb/ft³)

(2) Flow Conversion Factor (Uk)

Flow conversion factor Uk is obtained by carrying out the following computation depending on the selection of the fluid to be measured and the flow unit.

(a) Steam
M (Mass flowrate): $U_k=\rho_f\times U\rho_f\times U_k$ (kg) .... (10.7.1)
$U_k=\rho_f\times U_k$ (ℓb) .... (10.7.2)
Qf (Flowrate at operation): $U_k=U_k$ (m³) .... (10.7.3)
$U_k=U_k$ (acf) .... (10.7.4)

(b) Gas
Qn: (Flowrate at STP):

$$U_k=\frac{P_f}{P_n}\times\frac{P_f+273.15}{P_n+273.15}\times\frac{1}{K}\times U_{k\,(Nm^3)}$$ .... (10.8)

$$U_k=\frac{P_f}{P_n}\times\frac{\frac{5}{9}(T_n-32)+273.15}{\frac{5}{9}(T_n-32)+273.15}\times\frac{1}{K}\times U_{k\,(scf)}$$

M: (Mass flowrate): $U_k=\rho_f\times U\rho_f\times U_k$ (kg) .... (10.9.1)
$U_k=\rho_f\times U\rho_f\times U_k$ (ℓb) .... (10.9.2)
Qf: (Flowrate): $U_k=U_k$ (m³) .... (10.10.1)
$U_k=U_k$ (acf) .... (10.10.2)

(c) Liquid
Qf: (Flowrate): $U_k=U_k$ (m³) .... (10.11.1)
$U_k=U_k$ (acf) .... (10.11.2)
M (Mass flowrate): $U_k=\rho_f\times U$ (kg) .... (10.12.1)
$U_k=7.481\times\rho_f\times U$ (ℓb) .... (10.12.2)
7.481 is a conversion factor of U.S gal into acf

(d) User's unit
$U_k=U_k$ (user) .... (10.13)

$U\rho_f$: Unit conversion factors of density.
$U_{k(kg)}$, $U_{k(Nm3)}$, $U_{k(m3)}$
$U_{k(lb)}$, $U_{k(Btu)}$, $U_{k(scf)}$, $U_{k(acf)}$: Unit conversion factors

(3) Mass Flow calculation

a) Steam

In case of saturated steam, mass flow rate is calculated from density values to temperature measured by using saturated steam table.

In case of superheat steam, mass flow rate is calculated from density values to temperature measured by using steam table. In order to measure superheat steam, it is necessary to make constant pressure value. A pressure values which is entered in parameter is used.

$$M = \rho_{ft} \times Q_f \quad \text{.....(10.14.1)}$$

b) Gas

In case of gas, Volumetric flow rate at standard condition is calculated, so Pressure-Temperature correction is carried out. It is necessary to make constant pressure value. A Pressure values at operational condition, temperature and pressure value at standard condition which is entered in parameter is used.

$$Q_n = Q_f \times \frac{P_f}{P_n} \times \frac{T_n + 273.15}{T_{fT} + 273.15} \times \frac{1}{K} \quad \text{.....(10.14.2)}$$

c) Liquid

In case of liquid, mass flow late is calculated from which used to calculate the secondary function for the density value to the temperature. A density value which indicated by the order sheet is used.

$$M = \rho_n \times Q_f \times \{1 + a_1(T_{ft} - T_n) \times 10^{-2} + a_2(T_{ft} - T_n)^2 \times 10^{-6}\}$$
$$\text{.....(10.14.3)}$$

[Footnote]

$a_1 = \{(k_1 - 1) \times \Delta T2^2 - (k2 - 1) \times \Delta T1^2\} / \{(\Delta T1 \times \Delta T2^2 - \Delta T2 \times \Delta T1^2) \times 10^2\}$

$a_2 = \{(k_1 - 1) \times \Delta T2 - (k2 - 1) \times \Delta T1\} / \{(\Delta T1^2 \times \Delta T2 - \Delta T2^2 \times \Delta T1) \times 10^{-6}\}$

$\Delta T = T_f - T_n$

$k = \{(1 + a_1 \times \Delta T \times 10^{-2} + a_2 \times \Delta T^2 \times 10^{-6}\}$

Where

- M : Mass flow
- Q_n : Volumetric flow rate at Standard condition
- Q_f : Volumetric flow rate at oprtating condition
- T_n : Temperature at operating condition (°C), (°F)
- T_f : Temperature at standard condition (°C), (°F)
- T_{ft} : Measured temperature value (°C), (°F)
- P_f : Pressure at operating condition (kPa abs), (psi)
- P_n : Pressure at standard condition (kpa abs), (psi)
- K : Deviation factor
- ρ_{ft} : Density calculated by temperature value
- ρ_n : Density at Standard condition (kg/m^3), (lb/cf)
- ρ_f : Density at operating condition
- $U_{\rho t}$: Density unit conversion factor
- $U_{k(kg)}$, $U_{k(Nm^3)}$, $U_{k(m^3)}$: Flow unit conversion factor
- a_1 : 1st temperature coefficient
- a_2 : 2nd temperature coefficient

Example: conversion factor in kg.

kg : U_{kkg} =1

ton : U_{kkg} =0.001

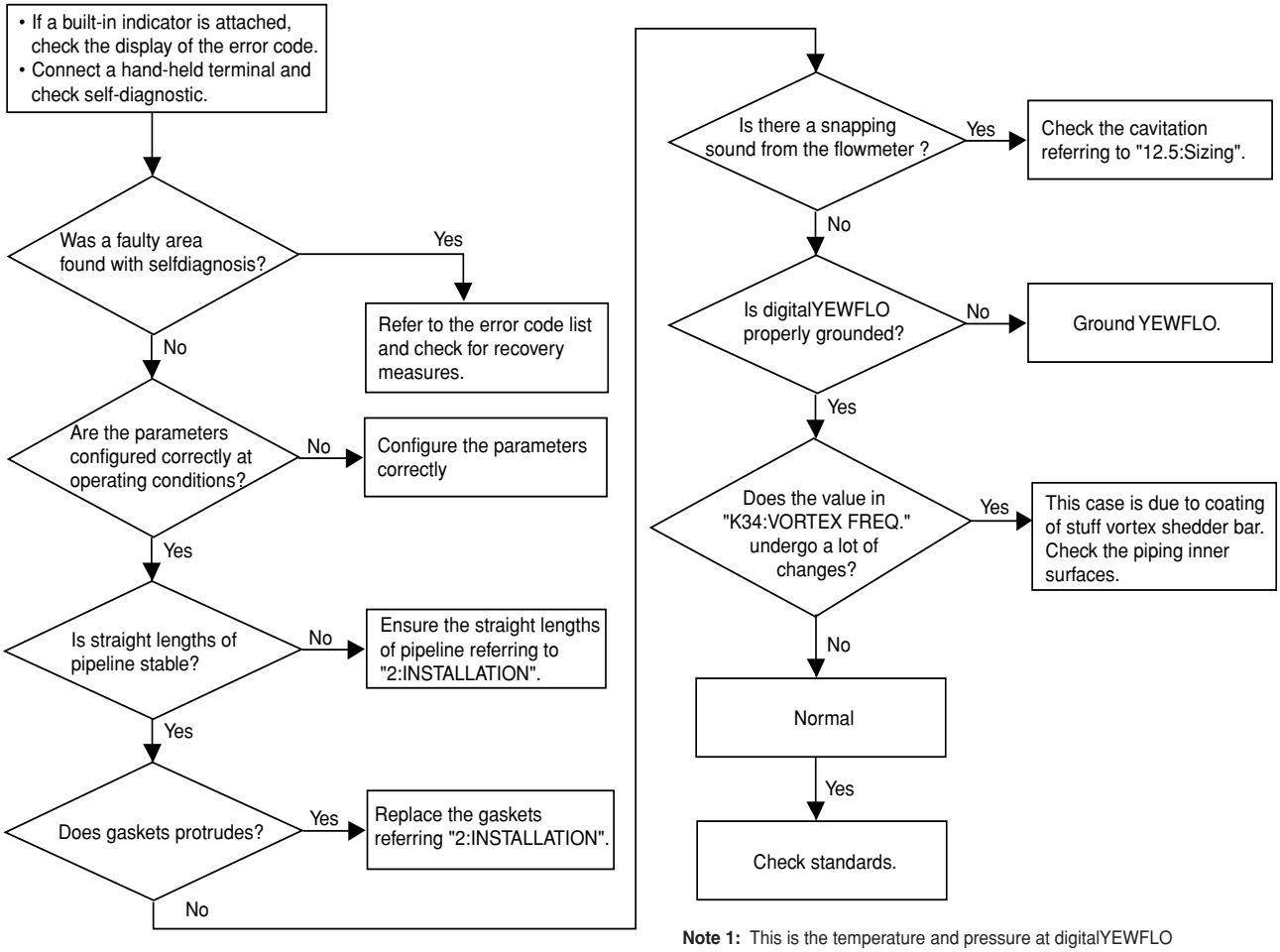
11. TROUBLESHOOTING

CAUTION

Please avoid replacing the amplifier unit from the case, and the vortex shedder bar. When these procedures are needed, please contact the nearest Yokogawa office.

11.1 Flow

● Large flowmeter errors and flowrate reading fluctuates.


• If a built-in indicator is attached, check the display of the error code.
• Connect a hand-held terminal and check self-diagnostic.
Was a faulty area found with selfdiagnosis?
Yes
Refer to the error code list and check for recovery measures.
No
Are the parameters configured correctly at operating conditions?
No
Configure the parameters correctly
Yes
Is straight lengths of pipeline stable?
No
Ensure the straight lengths of pipeline referring to "2:INSTALLATION".
Yes
Does gaskets protrudes?
Yes
Replace the gaskets referring "2:INSTALLATION".
No
Is there a snapping sound from the flowmeter ?
Yes
Check the cavitation referring to "12.5:Sizing".
No
Is digitalYEWFLO properly grounded?
No
Ground YEWFLO.
Yes
Does the value in "K34:VORTEX FREQ." undergo a lot of changes?
Yes
This case is due to coating of stuff vortex shedder bar. Check the piping inner surfaces.
No
Normal
Yes
Check standards.

Note 1: This is the temperature and pressure at digitalYEWFLO mounted place.
Note 2: Contact with our service in case this is not carried out into the right statement.

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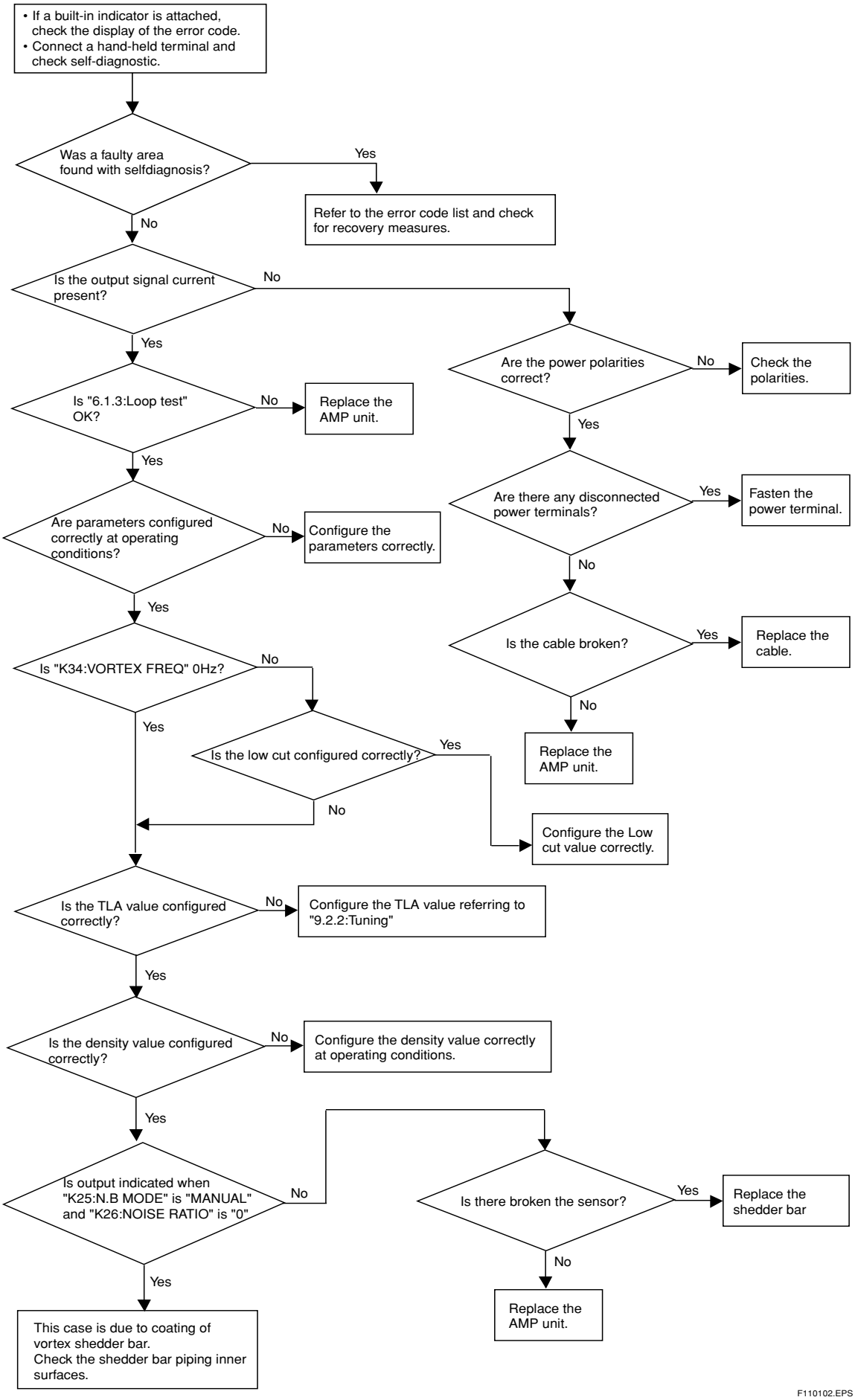
● After the output showed correctly, the indication goes down to zero at certain time.

When this problem occurred, the cause is suspected of deterioration of sensor sensitivity and turbulent of fluid flow due to coating on the shedder bar and flowmeter inner tube.

How to cope with this problem

1) Referring item 10.5 “Vortex Shedder Removal”, take out the Vortex Shedder bar and clean it.
2) If there is the coating on inner tube of the flowmeter, remove the flowmeter body from adjacent pipes and clean it.

● No output is indicated when the fluid is flowing.



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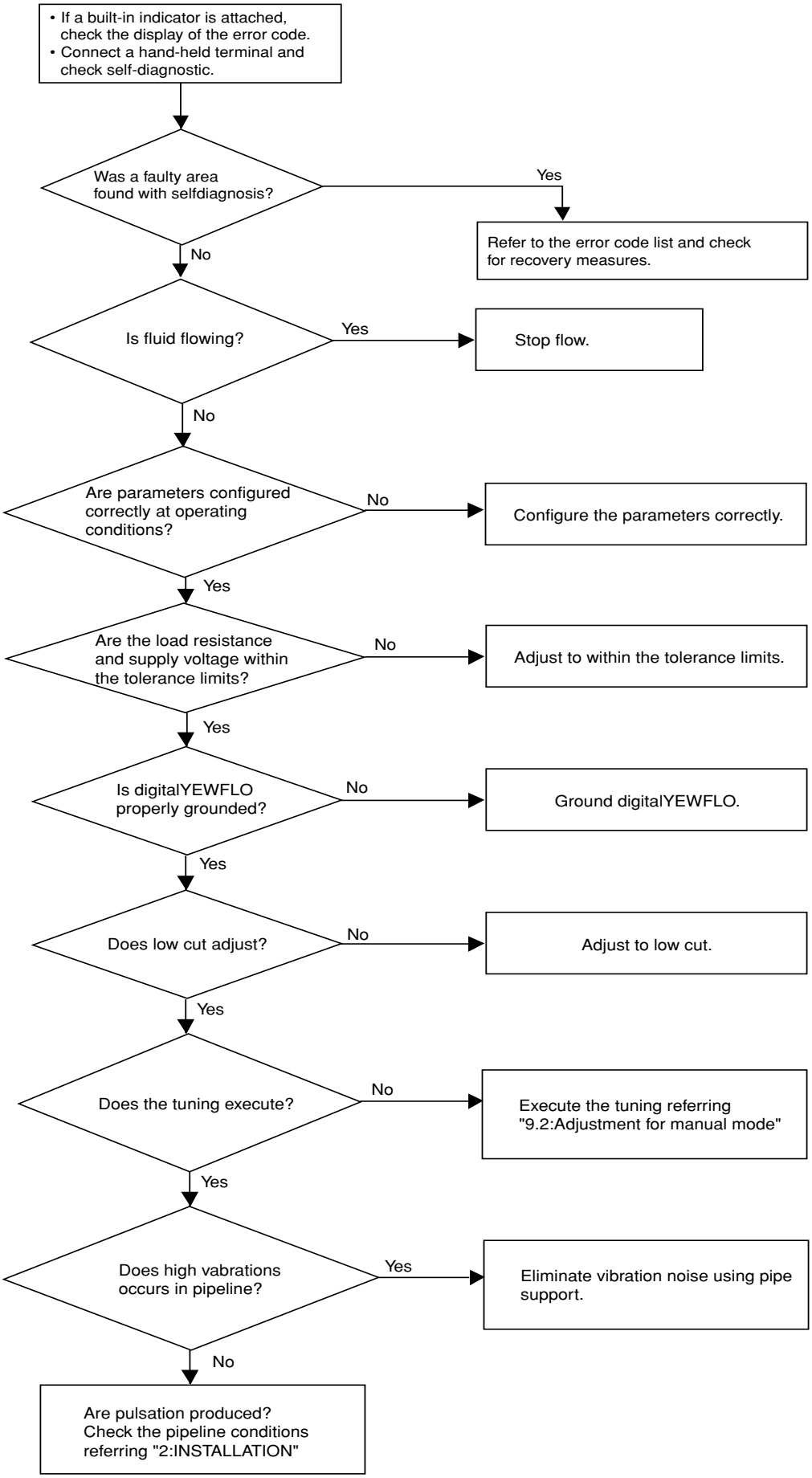
● Output is indicated at zero flow.



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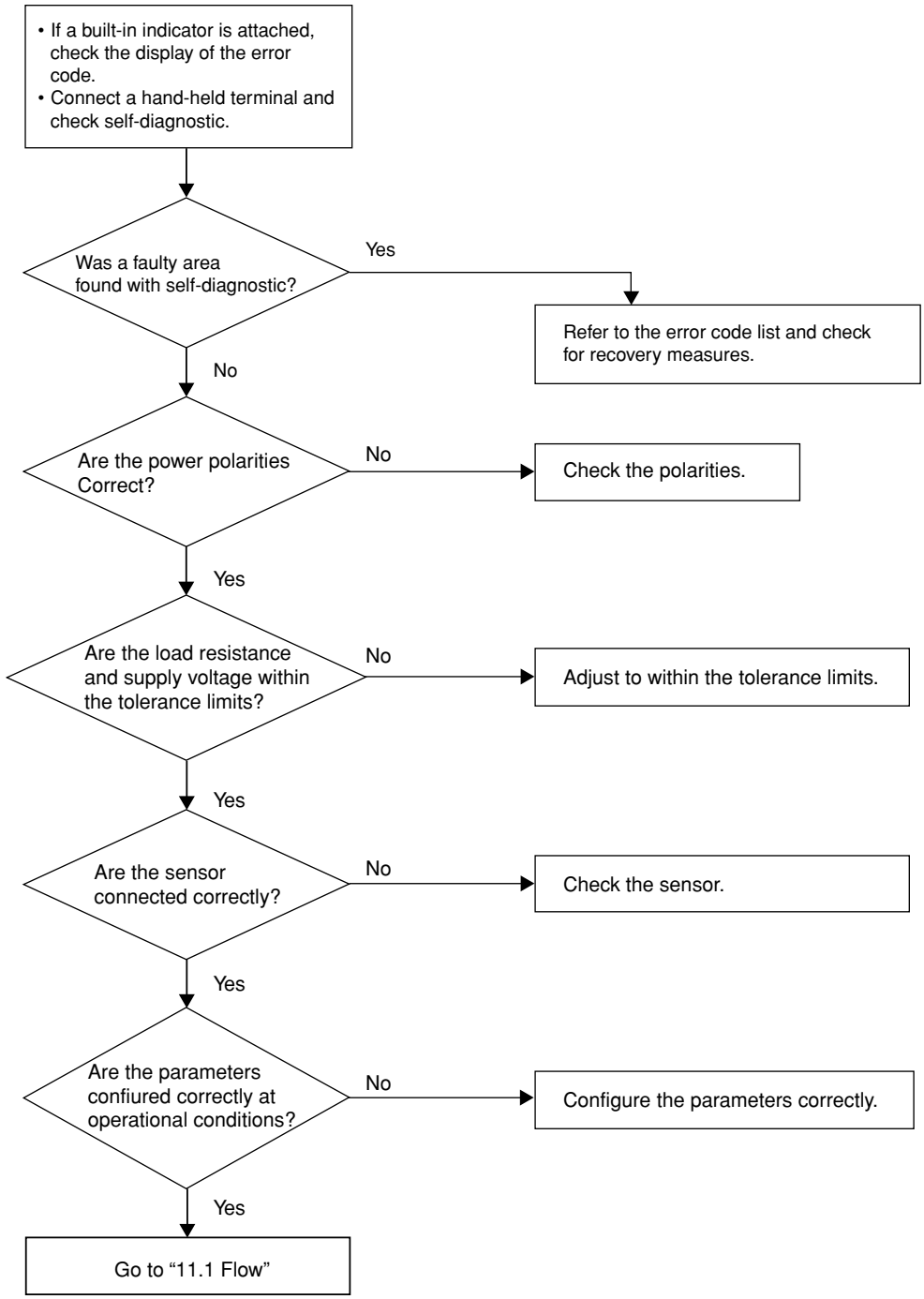
11.2 Flow (Only for /MV)

● **Start with this flow in case of /MV.**


• If a built-in indicator is attached, check the display of the error code.
• Connect a hand-held terminal and check self-diagnostic.
Was a faulty area found with self-diagnostic?
Yes
Refer to the error code list and check for recovery measures.
No
Are the power polarities Correct?
No
Check the polarities.
Yes
Are the load resistance and supply voltage within the tolerance limits?
No
Adjust to within the tolerance limits.
Yes
Are the sensor connected correctly?
No
Check the sensor.
Yes
Are the parameters confiured correctly at operational conditions?
No
Configure the parameters correctly.
Yes
Go to “11.1 Flow”

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12. GENERAL DESCRIPTION

12.1 Outline

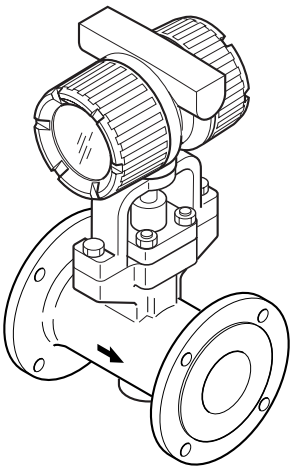
This vortex flowmeter measures liquid, gas and steam flow rates and converts them to a 4 to 20mA DC output or pulse, alarm, status output signal.

Since the converter is mounted independently from the flowmeter, it permits remote flow measurements of high temperature liquid, steam, etc.

■ Integral Type

The Integral Type Vortex Flowmeter (DY-A) has the converter with the flowmeter, and measures liquid, gas and steam flow rates and converts them to a 4 to 20mA DC output or pulse, alarm, status output signal.

Flange Type
(built-in indicator)



Wafer Type

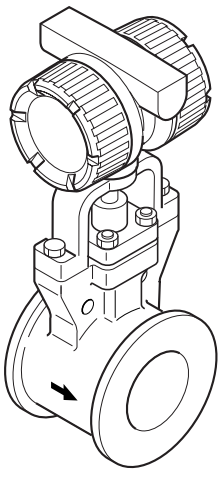


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Figure 12.1.1 External Views (Integral Type)

■ Remote Type

The Remote Converter Type Vortex Flowmeter (DY-N) is used with the Model DYA Vortex Flow Converter. A special cable (DYC) is used between these instruments.

Model DYA Vortex flow converter
(built-in indicator)

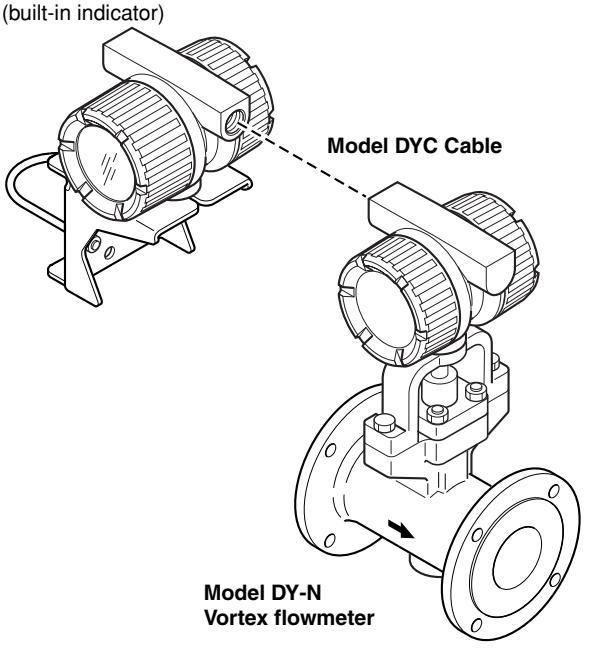

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Figure 12.1.2 External Views (Remote Type)

- **Name of a portion of the flowmeter (Example of the Wafer Type)**

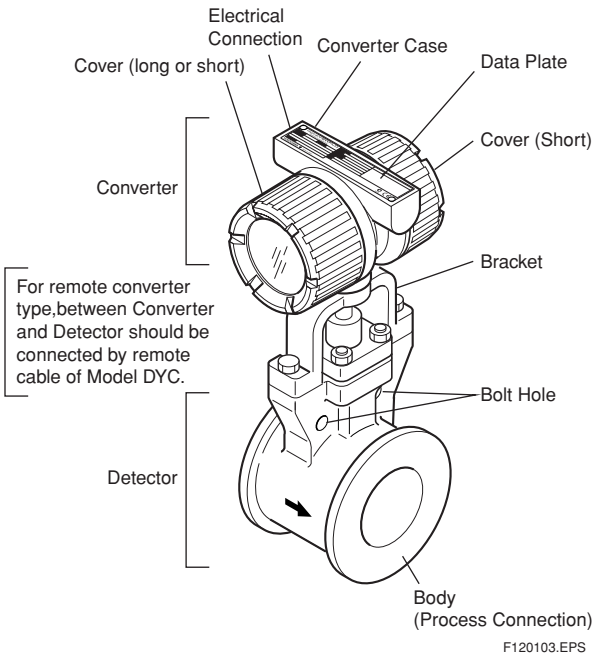

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Figure 12.1.3 Example of Name of portion

12.2 Standard Specifications

Refer to GS 01F06F01-01E for Fieldbus communication type, marked with "◇".

Performance Specifications

Fluid to be Measured :
Liquid, Gas, Steam (Avoid Multiphase Flow and Sticky Fluids)

Measuring Flow Rates :
Refer to Table 12.5.2

Accuracy : ±0.75% of Reading (Liquid)
±1% of Reading (Gas, Steam)
Refer to P12-16
For the Multi-Variable Type, refer to 12.4.2 term.

Repeatability : ± 0.2% of Reading

Calibration :
This flowmeter is factory-calibrated using a water flow.
Temperature and flow calibration by water flow when /MV is selected.

Normal Operating Condition

Process Temperature Range :
–29 to 250 °C (general)
–196 to 100 °C (Cryogenic Version:option)
–29 to 450 °C (High Process Temperature Version:option)
For the Multi-Variable Type, refer to 12.4.2 term.
Refer to Figure 1 for integral converter type.

Process Pressure Limit :
–0.1MPa (–1 kg/cm^2) to flange rating.

Ambient Temperature Range :
–29 to 85 °C (Remote type detector)
–40 to 85 °C (Remote type converter)
–29 to 85 °C (Integral type, refer to Figure 12.2.1)
–29 to 80 °C (Integral type with Indicator, refer to Figure 12.2.1)
–30 to 80 °C (Remote type converter with Indicator)

Ambient Humidity : 5 to 100% RH (at 40 °C)
(No Condensation)

Power Supply Voltage (◇) : 10.5 to 42 V DC
(Refer to Figure 12.2.2 ; Relationship Between Power Supply Voltage and Load Resistance)

Mechanical Specifications

Material (General Type):
Refer to Table 12.3.1

Wetted Parts:
Body; Stainless steel JIS SCS14A, ASTM, ASME CF8M
Shedder Bar; Duplex stainless steel
Size 15mm ASTM, S31803
Size 25mm to 300mm
DCS1*1, EN 1.4517
*1 DCS1 is a registered trademark of Daido Castings Co., Ltd.
Gasket: JIS SUS316 stainless steel with Teflon®* coating.
*Teflon® is a registered trademark of E.I. Du Pont de Nemours & Co.

Non-Wetted Parts:
Housing (Case, Cover):
Aluminum alloy JIS ADC12
Name Plate: Stainless steel JIS SUS304
DYA Mounting Bracket for 2B pipe:
Cold-reduced carbon steel sheet JIS SPCC, JIS SECC

Coating Color:
Housing:
Polyurethane corrosion-resistant coating
Deep sea moss green (Munsell 0.6GY 3.1/2.0)
DYA Mounting Bracket for 2B pipe:
Polyurethane corrosion-resistant coating
Frosty white (Munsell 2.5Y 8.4/1.2)

Protection:
IP67 immersion proof and dust proof. (NEMA 4X).

Hazardous Area Classifications:
Refer to 12.4 Option Specifications.

Electrical Connection:
JIS G1/2 female, ANSI 1/2 NPT female,
ISO M20 × 1.5 female

Signal Cable:
Model DYC cable, used for remote detector and converter.
Max. length : 30 m.
Outer Sheath Material: Heat resisting polyethylene
Durable Temperature : –40 to 150 °C

Weight:
Refer to 12.6 External Dimension.

Mounting:
Integral type and Remote type detector :
Flange mounting or wafer mounting by flange adjacent to the pipeline.
Remote type converter : 2 inch pipe mounting.

Electrical Specifications

Note*: Pulse output, alarm output and status output use the common terminal, therefore these functions are not used simultaneously.

Output Signal (◇) : Dual Output (Both Analog and Transistor contact output can be obtained simultaneously). In this case refer to "3: WIRING".

Analog : 4 to 20 mA DC, 2-wire system.

Transistor Contact Output* :
Open collector, 3-wire system.
Pulse, alarm, status output are selected by parameter setting.
Contact rating: 10.5 to 30 V DC, 120 mA DC
Low level: 0 to 2 V DC. (refer to Figure 12.2.3)

Communication Requirements :

Communication Signal :
BRAIN or HART communication signal (superimposed on a 4 to 20 mA DC signal)
Note: HART is a registered trademark of the HART Communication Foundation.

Selection of HART 5/ HART 7

Output Signal Code		-E	-J	
Ordering Information		—	Specify "5"	Specify "7"
HART Protocol Revision		HART 5		HART 7
Selection guide	Requirement for HART 7 functionarlity	NO		YES Be sure to confirm the protocol revision of the HART configuration tool shown in * 2.
	Other conditions	Not available to switch to HART 7 protocol after delivery.	Available to switch to HART 7 protocol after delivery by user-configuration.	—
Remarks		*1	*2	*2

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*1 : "-E" is HART 5 exclusive model and will be terminated. "-J" is recommended for HART communication.

*2 : HART protocol revision for the device and HART configuration tool
HART 7 communication is supported by FieldMate R2.02 or later.

	Protocol revision supported by HART configuration tool	
	5	7
DY or DYA HART 5	Available	Available
DY or DYA HART 7	Not available	Available

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Note: Protcol revision supported by HART configuration tool must be the same or higher than that of the device,

Conditions of Communication Line :

Load Resistance :
250 to 600 Ω(including cable resistance).
Refer to Figure 12.2.2

Supply Voltage :
16.4 to 42 V DC for digital communications BRAIN and HART protocols .(16.4 to 30 V DC for intrinsically safe type).
Refer to Figure 12.2.2

BRAIN:

Space from other Power Line: 15cm or more (Parallel wiring should be avoided.)

Communication Distance :
Up to 2 km, when polyethylene insulated PVC-sheathed cables (CEV cables) are used. Communication distance varies depending on type of cable used.

Load Capacitance: 0.22 μF or less

Load Inductance: 3.3 mH or less

Input Impedance of Receiver Connected to the Receiving Resistance:
10 kΩ or more at 2.4 kHz.

Functions:

Damping Time Constant :
0 to 99 Sec (63% response time)

Note: Delay time is 0.5 Sec.
Analog output circuit time constant is 0.3 Sec.

Pulse Output Function*:
Pulse output is selected from scaled pulse, unscaled pulse, frequency (number of pulses output per second at 100% of output).
Pulse frequency : Max 10 kHz
Duty cycles : Approx.50% (1:2 to 2:1)

Self -diagnostics and Alarm Output *:
In case alarm (over range output signal, EEPROM error, vibration noise, abnormal flow such as clogging, bubble) occurs, an alarm signal is output and indicated.
The alarm signal output goes from close(ON) to open(OFF) during alarming.

Status Output Function *:

Flow Switch:
In case flow rate decreases under the flow set value, a status signal is output.
Status signal output mode can reverse (ON/OFF) .

Analog Output Function:
Analog output is selected from flowrate temperature value when option code /MV is selected.

Data Security During Power Failure:
Data (parameter, totalizer value, etc) storage by EEPROM. No back-up battery required.

Correction:

Instrument Error Correction:
Vortex flowmeter instrument errors can be corrected by segment approximations.

Reynolds Number Correction:
Output error at Reynolds number 20000 or less is corrected by using five-break-point line-segment approximation.

Gas Expansion Correction:
When measuring a compressibility gas and steam, this expansion factor is useful to correct the error at high velocity of flow (35m/s or more).

Down-scale or Up-scale burn out.
In case a CPU or EEPROM failure occurs, flow meter output the signal of Up-scale (21.6 mA or more).
Up-scale or Down-scale (3.6 mA or less) is user-selectable through the fail mode alarm jumper.

Indicator:
Flow rate (% or engineering units) or temperature value and totalizer can be indicated simultaneously.
Short message for self diagnostics indicates.
Local parameter setting can be operated by key switches.
In mounting direction, the right and left 90° is rotatable.

EMC Conformity Standards:
EN61326-1 Class A, Table 2 (For use in industrial locations), EN61326-2-3
EN55011 Class A Group 1

Note1: This instrument is a Class A product, and it is designed for use in the industrial environment. Please use this instrument in the industrial environment only.

Note2: Use the metal conduit for the remote cable.

Pressure Equipment Directive:
Notified Body Identification Number 0038
Module H

MODEL	DN(mm)*	PS(Mpa)*	PS-DN (Mpa-mm)	CATEGORY**
DY015	15	42	630	Article 3***, Paragraph 3
DY025	25	42	1050	Article 3***, Paragraph 3
DY040	40	42	1680	II
DY050	50	42	2100	II
DY080	80	42	3360	II
DY100	100	42	4200	II
DY150	150	42	6300	III
DY200	200	42	8400	III
DY250	250	42	10500	III
DY300	300	42	12600	III

* PS : Maximum allowable pressure for Flow tube, DN : Nominal size
** Refered to Table 6 coverd by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC
*** DY015 and DY025 are not attached CE mark of PED because they do not under CE mark of PED

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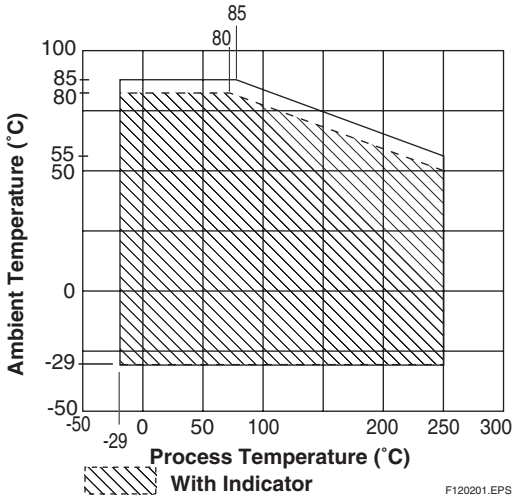

Figure 12.2.1 Ambient Temperature limit (Integral Type)

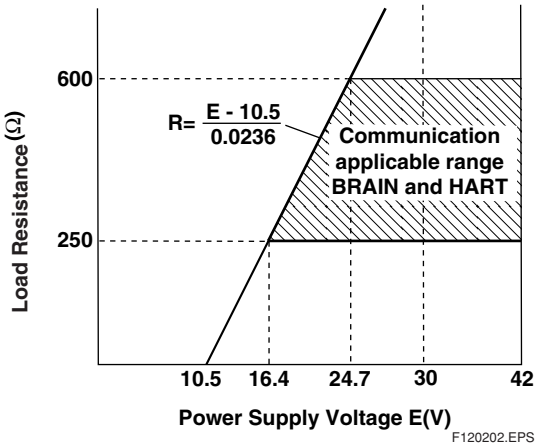

Figure 12.2.2 Relationship Between Power Supply and Load Resistance

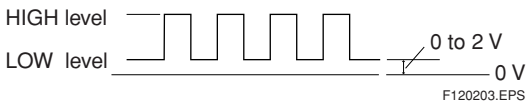

Figure 12.2.3 High and low level (Pulse output)

12.3 Model and Suffix Codes

DY Vortex Flowmeter (Integral Type, Remote type detector)

Model	Suffix Codes	Description
DY015		Size 15 mm (1/2 inch)
DY025		Size 25 mm (1 inch)
DY040		Size 40 mm (1-1/2 inch)
DY050		Size 50 mm (2 inch)
DY080		Size 80 mm (3 inch)
DY100		Size 100 mm (4 inch)
DY150		Size 150 mm (6 inch)
DY200		Size 200 mm (8 inch)
DY250		Size 250 mm (10 inch)
DY300		Size 300 mm (12 inch)
Output Signal /Commu-nication	-D	4 to 20 mA DC, Pulse, BRAIN Communication
	-E	4 to 20 mA DC, Pulse, HART Communication *1
	-J	4 to 20 mA DC, Pulse, HART 5/HART 7 Communication *2
	-F	Digital communication (FOUNDATION Fieldbus protocol) *3
	-N	Remote type detector
Body Material *8	A	JIS SCS14 A *4
	B	ASTM CF8M *5
	X	Others *6
Shedder bar Material *8	L	Duplex Stainless Steel
	B	Stainless Steel (for /HT, /NC)
	E	Duplex Stainless Steel (for TIIS Approval)
	X	Others *7
Process Connection *9 RF : Raised Face SF : Smooth Finish RJ : Ring Joint	AJ1	JIS 10 K Wafer
	AJ2	JIS 20 K Wafer
	AJ4	JIS 40 K Wafer
	AA1	ANSI Class 150 Wafer
	AA2	ANSI Class 300 Wafer
	AA4	ANSI Class 600 Wafer
	AD1	DIN PN10 Wafer
	AD2	DIN PN16 Wafer
	AD3	DIN PN25 Wafer
	AD4	DIN PN40 Wafer
	BJ1	JIS 10K Flange(RF)
	BJ2	JIS 20K Flange(RF)
	BJ4	JIS 40K Flange(RF)
	BA1	ANSI Class 150 Flange(RF)
	BA2	ANSI Class 300 Flange(RF)
	BA4	ANSI Class 600 Flange(RF)
	BA5	ANSI Class 900 Flange(RF)
	BS1	ANSI Class 150 Flange(RF, SF)
	BS2	ANSI Class 300 Flange(RF, SF)
	BS4	ANSI Class 600 Flange(RF, SF)
	BS5	ANSI Class 900 Flange(RF, SF)
	BD1	DIN PN10 Flange(RF)
	BD2	DIN PN16 Flange(RF)
	BD3	DIN PN25 Flange(RF)
	BD4	DIN PN40 Flange(RF)
	CA4	ANSI Class 600 Flange(RJ)
	CA5	ANSI Class 900 Flange(RJ)
Electrical Connection *10	-0	JIS G 1/2 Female
	-2	ANSI 1/2 NPT Female *11
	-4	ISO M20×1.5 Female
Indicator *12	D	With Indicator
	N	None Indicator, Remote type detector
Options	/□	Refer to Option Specifications

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DYA Vortex Flowmeter Converter(Remote Type)

Model	Suffix Code	Description
DYA		Vortex Flowmeter Converter (Remote Type)
Output Signal /Commu-nication	-D	4 to 20 mA DC, Pulse BRAIN Communication
	-E	4 to 20 mA DC, Pulse HART Communication *1
	-J	4 to 20 mA DC, Pulse HART 5/ HART 7 Communication *2
	-F	Digital communication (FOUNDATION Fieldbus protocol) *3
Electrical Connection *10	0	JIS G 1/2 Female
	2	ANSI 1/2 NPT Female *11
	4	ISO M20 ×1.5 Female
Indicator	D	With Indicator
	N	None Indicator
Options	/□	Refer to Option Specifications
	/MV	Multi-Variable Type *13

DYC Signal Cable

Model	Suffix Code	Description
DYC		Signal Cable
Cable End	-0	Without End finish *14
	-1	With End finish
Cable Length *15	-05	5 m
	-10	10 m
	-15	15 m
	-20	20 m
	-25	25 m
	-30	30 m
	-35	35 m
	-40	40 m
	-45	45 m
	-50	50 m
	-55	55 m
	-60	60 m
	-65	65 m
	-70	70 m
	-75	75 m
	-80	80 m
	-85	85 m
	-90	90 m
	-95	95 m
Options	/C1	Cable End Finish Parts 1 set
	/C2	2 set
	/C3	3 set
	/C4	4 set
	/C5	5 set
	/C6	6 set
	/C7	7 set
	/C8	8 set
	/C9	9 set
	/MV	Multi-variable Type *13

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* 1 : Output signal code '-E': HART 5 (output signal code '-J' is recommended for HART communication).
* 2 : Output signal code '-J': HART 5 or HART 7 selectable. Specify HART 5 or HART 7 when ordering.
* 3 : For FOUNDATION Fieldbus protcol, refer to GS 01F06F01-01E. For Fieldbus communication type, there are not setting keys on the display board.
* 4 : In case of A (JIS SCS14A), the process connection is available for JIS (AJ1, AJ2, AJ4, BJ1, BJ2, BJ4)
* 5 : In case of B (ASTM CF8M), the process connection is available for ANSI (AA1 to 4, BA1 to 5, BS1 to 5, CA4 to 5) and DIN (AD1 to 4, BD1 to 4).
* 6 : Refer to Table 12.3.1.
* 7 : Refer to Table 12.3.1.
* 8 : Users must consider the characteristics of selected wetted parts material and the influence of process fluids. The use of inappropriate materials can result in the leakage of corrosive process fluids and cause injury to personnel and/or damage to plant facilities. It is also possible that the instrument itself can be damaged and that fragments from the instrument can contaminate the user's process fluids.
  Be very careful with highly corrosive process fluids such as hydrochloric acid, sulfuric acid, hydrogen sulfide, sodium hypochlorite, and high-temperature steam (150°C [302°F] or above). Contact Yokogawa for detailed information of the wetted parts material.
* 9 : Refer to Table 12.3.2.
*10 : In case of an explosion protect type, it depends for an electrical connecion on the kind of an explosion protect type. Refer to " OPTION SPECIFICATION (HAZARDOUS AREA CLASSIFICATIONS)"
*11 : In case of /FF1 or /CF1, the screw length is deeper than ANSI standard for 0.5 to 3.5 threads.
*12 : Indicator is not available for remote type detector.
*13 : DYA-□□□/MV and DY□□□-N***/MV should be combined.
*14 : One set of end finish part is attached.
*15 : DYC Cable can be used up to 30m. When you divide the cable below 30m, select the Cable End code [-0].

Table 12.3.1 Body, Shedder bar, Gasket Material

Body Material

Model (Note 3)			Standard (Note 1)	Anti-corrosion version II (/HY) (Note 2)	High process temperature version (/HT) (Note 2)	Cryogenic version (/LT) (Note 2)	NACE Material (/NC)
DY015	DY025/R1	DY040/R2	**A** JIS SCS14A **B** ASTM CF8M	**X** (Note 2) JIS SCS14A ASTM CF8M	—	**X** (Note 2) DIN1.4308 (JIS SCS13)	**X** ASTM CF8M
DY025	DY040/R1	DY050/R2			**X** (Note 2) JIS SCS14A ASTM CF8M		
DY040	DY050/R1	DY080/R2					
DY050	DY080/R1	DY100/R2					
DY080	DY100/R1	DY150/R2					
DY100	DY150/R1	DY200/R2					
DY150	DY200/R1	—		—		—	
DY200	—	—		—		—	
DY250	—	—		—		—	—
DY300	—	—		—		—	—

(Note1) In case of the suffix code of the body material is A, the code of the process connection is for one of AJ□, AJ□, BJ□, AP□ or BP□.
In case of the code B, process connection code is for one of AA□, BA□, BS□, CA□, AD□ or BD□.
(Note2) In cases of optional specifications code "/HY", "/HT", "/LT", or "NC", select "X" for both body material code and select shedder bar material code in accordance with the shedder bar material chart.
(Note3) Reduced bore type is Flange type only.

Shedder bar material

Model (Note 3)			Standard	TIIS Flame proof approval (/JF3) (Note 2)	Anti-corrosion version II (/HY) (Note 1,2)	High process temperature version (/HT) (Note 1,2)	Cryogenic version (/LT) (Note 1,2,3)	NACE Material (/NC) (Note 1,2)
DY015	DY025/R1	DY040/R2	**L** ASTM S31803	**E** ASTM S31803	**X** ASTM N10276	—	**X** ASTM N10276	**X** ASTM N10276
DY025	DY040/R1	DY050/R2	**L** DCS1 or EN1.4517	**E** EN1.4517	**X** ASTM CW-12MW	**X** ASTM CW-12MW	**X** ASTM CW-12MW	**X** ASTM CW-12MW
DY040	DY050/R1	DY080/R2						
DY050	DY080/R1	DY100/R2						
DY080	DY100/R1	DY150/R2						
DY100	DY150/R1	DY200/R2						
DY150	DY200/R1	—			—	**X** ASTM CW-12MW or **B** ASTM CF8M (Note 4)	—	**X** ASTM CW-12MW or **B** ASTM CF8M (Note 4)
DY200	—	—			—		—	
DY250	—	—			—	**B** ASTM CF8M (Note 5)	—	—
DY300	—	—			—		—	—

(Note1) Select body code [X] for /HY, /HT, /LT and /NC.
(Note2) Select shedder bar code [E] in case of TIIS Flame proof type (/JF3).
The combination of /JF3 and /HY, /HT, /LT and NC, select shedder bar code [X].
(Note3) Wafer type (Process Connection:A**): DY015-DY100, Flange type (Process Connection :B**) : DY015-DY300
Reduced bore type is Flange type only.
(Note4) Shedder bar code [X] or [B] is selectable for DY150/HT, DY150/NC, DY200/HT and DY200/NC.
In case of the combination with /JF3, shedder bar code [X] is selectable only.
(Note5) Select shedder bar code only [B] for DY250/HT and DY300/HT.
DY250/HT/JF3 and DY300/HT/JF3 are not available. (Incl.Tokuchu)

Gasket material

Model (Note 1)			Standard	Anti-corrosion version II (/HY)	High process temperature version (/HT)	Cryogenic version (/LT)	NACE Material (/NC)
DY015	DY025/R1	DY040/R2	JIS SUS316 stainless steel with polytetra-fluoroethylene (Teflon) coating	JIS SUS316 stainless steel with polytetra-fluoroethylene (Teflon) coating	—	JIS SUS316 stainless steel with polytetra-fluoroethylene (Teflon) coating	JIS SUS316 stainless steel with polytetra-fluoroethylene (Teflon) coating
DY025	DY040/R1	DY050/R2			JIS SUS316 stainless steel plated with silver		
DY040	DY050/R1	DY080/R2					
DY050	DY080/R1	DY100/R2					
DY080	DY100/R1	DY150/R2					
DY100	DY150/R1	DY200/R2					
DY150	DY200/R1	—		—		—	
DY200	—	—		—		—	
DY250	—	—		—		—	—
DY300	—	—		—		—	—

(Note1) Wafer type (Process Connection:A**): DY015-DY100, Flange type (Process Connection :B**) : DY015-DY300
Reduced bore type is Flange type only.

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Table 12.3.2 Flowmeter Selection Guide

Process Connection	Wafer		Flange(Raised Face)				Flange(Ring Joint)		Flange(Raised Face, Smooth Finish)			
	Suffix Code	Model Code	Suffix Code	Model Code			Suffix Code	Model Code	Suffix Code	Model Code		
JIS 10 K	AJ1	DY015 up to DY100	BJ1	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	—	—	—	—		
JIS 20 K	AJ2	DY015 up to DY100	BJ2	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	—	—	—	—		
JIS 40 K	AJ4	DY015 up to DY100	BJ4	DY015 up to DY150			—	—	—	—		
ANSI Class 150	AA1	DY015 up to DY100	BA1	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	—	—	BS1	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2
ANSI Class 300	AA2	DY015 up to DY100	BA2	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	—	—	BS2	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2
ANSI Class 600	AA4	DY015 up to DY100	BA4	DY015 up to DY200			CA4	DY015 up to DY200	BS4	DY015 up to DY200		
ANSI Class 900	—	—	BA5	DY015 up to DY200			CA5	DY015 up to DY200	BS5	DY015 up to DY200		
DIN PIN 10	AD1	DY015 up to DY100	BD1	DY015 up to DY200			—	—	—	—		
DIN PIN 16	AD2	DY015 up to DY100	BD2	DY015 up to DY200			—	—	—	—		
DIN PIN 25	AD3	DY015 up to DY100	BD3	DY015 up to DY200			—	—	—	—		
DIN PIN 40	AD4	DY015 up to DY100	BD4	DY015 up to DY200			—	—	—	—		

(Note)
• ANSI standardized types are worked by serration finishing except the Smooth Finish type.
• Refer to “12.4.3 OPTION REDUCED BORE TYPE (/R1, /R2)”, when you select reduced bore type (/R1, /R2).

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12.4 Option Specifications

12.4.1 Option Specifications

Item	Specification	Applicable Model	Code
Multi-Variable Type (Note 5)	Build in Temperature sensor (Pt 1000) in vortex shedder bar.	DY / DYA	MV
Reduced bore type (Note 8) See 12.4.3	Integrated and welded construction with concentric reduced bore piping. R1 : Detector size is one meter body size down of digitalYEWFLO to flange pipe size.	DY	R1
	R2 : Detector size is two meter body size down of digitalYEWFLO to flange pipe size.		R2
Stainless Steel Tag Plate (Note 1)	JIS SUS304 tag plate, hung on the case.	DY / DYA	SCT
Stainless Steel Bolt & Nut Assembly	JIS SUS304 bolt/nut assembly. Used when a wafer type is installed.	DY Wafer Type	BL
Paint Color Change	Only for the covers.	DY / DYA	See Table12.4.1
Hydrostatic / Pneumatic Test Certificate	Test pressure value is in accordance with Table 12.4.2. Test time: 10 minutes. Available for the general type. Test medium: Air, Nitrogen or Water.	DY	T01
Hydrostatic Test Certificate	Test pressure value is in accordance with Table 12.4.2. Test time: 10 minutes. Available for the general type. Test medium: Water.	DY	T02
Degrease Treatment (Note 2)	Degrease cleansing treatment.	DY	K1
Epoxy Coating	Epoxy coating for case and cover.	DY / DYA	X1
Pilling up coating to keep off corrosion	Epoxy and Polyurethane coating for the purpose of corrosion - proof improvement; salt damage, alkali, climate and acidity	DY, DYA	X2
High Process Temperature Version	For Liquid and Steam (NOT for Gas) This specification temperature is from -29 to +450 ℃ Refer to Table 12.3.1 , Figure 12.4.1. Refer to Table 12.5.1 for minimum velocity.	DY***-N	HT
Cryogenic Version (Note 7)	This specification temperature is from -196 to +100 ℃ Refer to Table 12.3.1 , Figure 12.4.2. (/R1 and /R2 are not available)	DY***-N	LT
Stainless Steel Bracket for Remote Conveter (DYA)	The bracket material for remote converter type (DYA) is JIS SUS304.	DYA	SB
Lightning Protector	There is an arrester inside converter for power supply line. Maximum power supply voltage : 30VDC	DY***-D,E / DYA	A
NACE Material (Note 10)	The wetted parts materials conform to NACE material recommendations per MR0175. Refer to Table 12.3.1.	DY	NC
Compliance with NAMUR (Note 6)	Compliance with NAMUR43. Current signal for measurement is 4mA up to 20.5mA. Set output 3.6mA or less when burn-out occurred.	DY***-D,E / DYA-D,E	NM
Anti-corrosion Version II	Anti-corrosion Version II. Refer to Table 12.3.1. DY150/R1, DY150/R2 and DY200/R2 are not available.	DY	HY
Converter Installing Direction 180 Change (Note4)	Converter installing direction 180° change inversely when shipped.	DY	CRC
Down-scale burn-out in CPU or EEPROM failure (Note 3)	Set output 3.6mA or less when burn-out occurred.	DY***-D,E / DYA	C1
Stainless steel housing (Note 9)	Converter housing, case and cover material: JIS SCS14A or ASTM, ASME CF8M stainless steel castings. (equvalent to JIS SUS316)	DY***-N / DYA	E1
Flameproof Packing Adapter	Power source connection port and signal cable (remote type) connection port. JIS G1/2 female thread. Other cable shape: ø 8 to ø 12. G11 : One piece, G12 : Two pieces.	DY / DYA, / JF3	G11
			G12
Calibration Certificate	Level 2 Declaration and Calibration Equipment List	DY / DYA	L2
	Level 3 Declaration and Primary Standard List	DY / DYA	L3
	Level 4 Declaration and YOKOGAWA Measuring	DY / DYA	L4

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Item	Specification		Applicable Model	Code
Material certificates: Mill sheets	Each certificate to be attached produced by the vendors.		DY	
	Item to be specified	1. Meterbody		M01
		1. Meterbody, 2. Shedder bar		M02
		1. Meterbody, 2. Shedder bar, 3. Bottom plug		M03
		1. Meterbody, 2. Shedder bar, 3. Bottom plug, 4. Welding rod		M04
Material certificates: EN10204 3.1	Each certificate to beattached produced by the vendors.		DY	
	Item to be specified	1. Meterbody		E01
		1. Meterbody, 2. Shedder bar		E02
		1. Meterbody, 2. Shedder bar, 3. Bottom plug		E03
		1. Meterbody, 2. Shedder bar, 3. Bottom plug, 4. Welding rod		E04
PAMI test certificate	Positive Material Identification certificate to be attached for the main 3 chemical components of specified materials. Each certificate to be attached.		DY	
				PM1
	Item to be specified	1. Meterbody		PM2
		1. Meterbody, 2. Shedder bar		
ASME welding documents submission	1. Welder/Welding Operator Performance Qualification (or Welder Qualification Record) 2. Welding Procedure Specification (WPS) 3. Procedure Qualification Record (PQR) Each certificate to be submitted. The customer's name and job name to be specified when ordered.		DY	WP
	Item to be specified	1. Welded portion for the bottom plug 2. Welded portion for the flange in case of the welding construction		
Liquid Penetrant test certificate	Dye Penetrant test certificate for the welded portion to be attached. Each certificate to be attached.		DY	PT
	Item to be specified	1. Welded portion for the bottom plug 2. Welded portion for the flange in case of the welding construction	DY 2. is for DY250 and DY300.	

(Note 1) The specified Tag Number is engraved on the data plate and stainless tag plate. The limitation of characters for Tag Number is, for BRAIN Terminal or name plate, stainless steel tag plate: 16 characters, and for HART Configuration Tool: 8 characters.
(Note 2) There is a case that calibration water should stay in the meter tube. So this is not degrease treatment in the strict sense.
(Note 3) The output is set 3.6mA or less (General type is set 21.6mA or more at shipping).
(Note 4) The electrical connection turn to a downstream side.
(Note 5) Refer to "OPTION MULTI-VARIABLE (BUILD IN TEMPERATURE SENSOR) TYPE (/MV)" (see 12.4.2)
In case of Remote type detector (DY***-N), select "/MV" both DY and DYA.
(Note 6) /NM can not combine with Remote type (DY***-N).
(Note 7) Cryogenic version (/LT) can not combine with ATEX Flameproof (/KF2), ATEX Type n (/KN2) or IECEx Flameproof (/SF2).
(Note 8) • Cryogenic version (/LT) is not available.
• High process temperature version (/HT) and Multi-variable type (/MV) for DY025/R1 and DY040/R2 are not available.
• Explosion protected type SAA (/SS1) is not available.
• Flange type only and available process connections are JIS10k, 20k (BJ1, BJ2) and ANSI150, 300 (BA1,BA2,BS1,BS2).
• Model Code size means "DY***-" nominal size.
(Note 9) • Applicable for option code /FF1, /FS1, /KF2, /KS1, /KN2 and /SF2.
• Not applicable for option code: /P1, /P2, /P7, /X1, /X2, /HT, /LT, /SB, /JF3, /CF1, /CS1, /CF11, /CS11, /SS1.
• The materials of exterior parts, name plate, screw, bolts on the stainless steel housing and bracket, u-bolt, nuts for DYA/E1 and tag plate for /E1/SCT are JIS SUS316 or SUS316L.
(Note 10) NACE Material (/NC) can not combine with ASME welding documents submission (/WP).

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Table 12.4.1 Paint Color and Codes

Codes	Munsell Renotation Code	Color
P1	N1.5	Black
P2	7.5BG4/1.5	Jade green
P7	————	Metallic silver

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Table 12.4.2 Test Pressure Value

Flange Rating	Pressure
JIS 10 K	2.1 MPa
JIS 20 K	5.0 MPa
JIS 40 K	10.0 MPa
ANSI Class 150	2.9 MPa
ANSI Class 300	7.5 MPa
ANSI Class 600	14.9 MPa
ANSI Class 900	22.4 MPa
DIN PN 10	1.5 MPa
DIN PN 16	2.4 MPa
DIN PN 25	3.8 MPa
DIN PN 40	5.9 MPa

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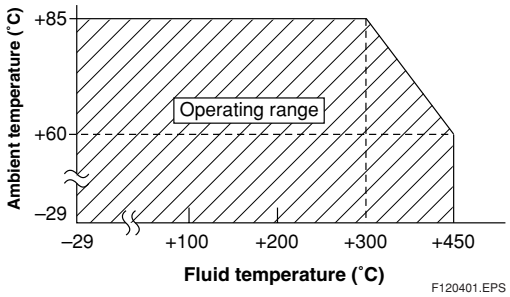

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Figure 12.4.1 Fluid temperature range of high process temperature version

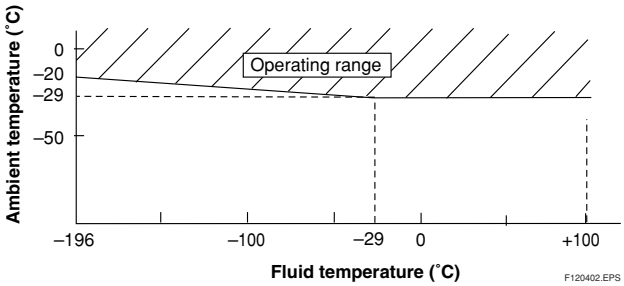

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Figure 12.4.2 Fluid temperature range of cryogenic version

12.4.2 Option Multi-Variable (Build in Temperature Sensor) Type (/MV)(*1)

This option is the same as standard specification except the following items.

		Multi-variable Type					Standard Type
Size		Wafer Type	25mm to 100mm				15mm to 100mm
		Flange Type	25mm to 200mm				15mm to 300mm
Function		Only for indication and output	Mass Flow calculation. (Volumetric flowrate at Standard condition for GAS)				
Fluid		Liquid, Gas Saturated Steam Superheat Steam	Saturated Steam	Superheat Steam	Gas	Liquid	Liquid, Gas Saturated Steam Superheat Steam
Temperature Range		–29 to 250°C	100 to 250°C	100 to 250°C	–29 to 250°C	–29 to 250°C	–29 to 250°C
Accuracy (*2)	Mass Flow		Refer to “Detailed Accuracy” (See P.12-16)				
	Temperature		±0.5% OF RATE	±1% OF RATE	±1°C (Less than 100°C) ±1% OF RATE (100°C or more)	±0.5°C (Less than 100°C) ±0.5% OF RATE (100°C or more)	
Temperature Response (50% response)		60sec (Churning Underwater)					
Mass Flow Calculation Method			Density Calculation (*3)	Density Calculation (Constant pressure is assumed) (*4)	Temp.-Pressure Correction (Constant pressure is assumed) (*5)	Density change Calculation (*6)	
Output	Analog Output	Select from Flow rate or temperature (*7)					Only for Flow Rate
	Pulse Output	Only for Flow rate					Only for Flow Rate
	Alarm Output	Standard Alarm+Error of thermometer etc.					Only for Standard
	StatusOutput	Only for Flow Switch					Flow Switch
Display	Upper	Select from Flow rate (%,Engineering Unit) or Temperature (%) (*8)					Only for Flow Rate
	Lower	Select from Total Rate or temperature (C, F) (*9)					Only for Total Rate
Remote Type		Flow Converter : Select DYA-□□□/MV Signal Cable : Select DYC-□□□/MV (*10)					

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(*1) When /MV is chosen, /HT, /LT is not available.

(*2) Measurement temperature is changed by the heat-insulation method of piping and piping method. Refer to 2.2 Piping, about heat-insulation (P.2-3). In case of the Mass Flow measurement of saturated steam and superheat steam, it is necessary to make a heat-insulation.

(*3) Mass Flow rate is calculated from density values by temperature measurement using saturated steam table.

(*4) Mass Flow rate is calculated from density values to temperature measured by using steam table. In order to measure superheated steam, it is necessary to make constant pressure value. A pressure values which is indicated by order sheet is used.

(*5) In order to measure gas, Pressure-Temperature correction is carried out. It is necessary to make constant pressure value.
A pressure values at operational condition, temperature and pressure value at standard condition which is indicated by order sheet is used.

(*6) In order to measure mass flowrate of liquid application, the density at normal condition is used, and if fluid temperature deviates from normal temperature density values is calculated by 2 dimensional equation. In this case, temperature coefficient should be prepared by user’s side.

(*7) Default setting is Flow rate. It is necessary to change the parameter of output in case of setting temperature output.

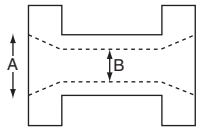
(*8) In case of indicating the temperature %, the display indicate not only “%” but also “t” . (“t” is the means of temperature)

(*9) Default setting is “temperature” but “Total “ is setup when ordering the Total Rate.

(*10) For the Remote Type (DY***-N/MV), be sure to set the parameter of cable length for DYA, Remote Type converter.

12.4.3 OPTION REDUCED BORE TYPE (/R1, /R2) (*1)

This option is the same as standard specification except the following items.

	Reduced bore type (Option Code: /R1, /R2)			
Model Code (Note 2) 	Flange piping size (A)	R1 Detector size (inner dia.) (B)	R2 Detector size (inner dia.) (B)	[Pressure Loss] R1: about 15% increases to standard type. R2: about 28% increases to standard type. see P.12-19
	DY025	15 (14.6) (mm) (Note 3)		
	DY040	25 (25.7) (mm)	15 (14.6) (mm) (Note 3)	
	DY050	40 (39.7) (mm)	25 (25.7) (mm)	
	DY080	50 (51.1) (mm)	40 (39.7) (mm)	
	DY100	80 (71) (mm)	50 (51.1) (mm)	
	DY150	100 (93.8) (mm)	80 (71) (mm)	
	DY200	150 (138.8) (mm)	100 (93.8) (mm)	
Measurable minimum flow velocity	Refer to table 12.5.1.			
Range of measurable flow velocity	Refer to table 12.5.2.			

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(Note 1) For detailed accuracy, see “SIZING”. Not available for /LT.
Not available for /SS1

(Note 2) Flange type only: JIS10K,20K (BJ1,BJ2) and ANSI150,300 (BA1,BA2,BS1,BS2)
MS Code [*] of “DY***-” means flange piping size.

(Note 3) High process temperature version (/HT) and Multi-variable type (/MV) for DY025/R1 and DY040/R2 are not available.

12.4.4 Option Specifications (For Explosion Protected Type)

Item	Specification	Code
TIIS Certification	TIIS Flameproof Approval (Note 1) Flameproof Ex d IIC T6 Certified by TIIS. (TIIS is the abbreviation of Technology Institution of Industrial Safety.) Amb. Temp: –20 to 60°C Electrical connection: JIS G1/2 female	JF3
Factory Mutual (FM)	FM Explosion proof Approval Applicable Standard: FM3600, FM3611, FM3615, FM3810, Including Supplement 1, ANSI/NEMA 250 Type of Protection : Explosion proof for Class I, Division 1, Groups A, B, C and D; Dust-ignitionproof for Class II/III, Division 1, Groups E, F, and G. "SEAL ALL CONDUITS WITHIN 18 INCHES." "WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED." Enclosure Rating : NEMA Type 4X Temperature Code : T6 Ambient Temperature : –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Maximum Working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Electrical Connection : ANSI 1/2NPT female	FF1
	FM Intrinsically safe Approval (Note 2) Applicable Standard: FM3600, FM3610, FM3611, FM3810, NEMA-250, ANSI/ISA-60079-0, ANSI/ISA60079-11 Type of Protection : Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G, T4, and Class I, Zone 0, AEx ia IIC T4 Nonincendive for Class I, II, Div.2, Groups A, B, C, D, F and G, Class III, DIV.1, T4, and Class I, Zone 2, Groups IIC, T4 Ambient Temperature : –29 to +60°C (Integral Type Vortex Flowmeter) –29 to +80°C (Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Maximum Working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Indoors and Outdoors : NEMA Type 4X Electrical Parameter : Vmax=30Vdc, Imax=165mAdc, Pi=0.9W, Ci=12nF, Li=0.15mH Electrical Connection : ANSI 1/2NPT female	FS1
ATEX	ATEX Flameproof Approval (Note 3) Applicable Standard: EN60079-0, EN60079-1 Type of Protection : II 2 G Ex d IIC T6...T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) II 2 G Ex d IIC T6 Gb (Remote Type Vortex Flow Converter) Group : II, Category : 2G Temperature Class : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Process Temp. : T6(–29 to 80°C), T5(–29 to 100°C), T4(–29 to 135°C), T3(–29 to 200°C), T2(–29 to 300°C), T1(–29 to 450°C) (Use /HT version above 250°C) Ambient Temperature: –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) : –40 to +60°C (Remote Type Vortex Flow Converter without indicator) : –30 to +60°C (Remote Type Vortex Flow Converter with indicator) Ambient Humidity: 0 to 100% RH Electrical connection : ANSI 1/2NPT female, ISO M20 × 1.5 female.	KF2
	ATEX Intrinsically safe Approval (Note 2) Applicable Standard : EN50014, EN50020, EN50284 Type of protection : EEx ia IIC T4...T1(Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) EEx ia IIC T4(Remote Type Vortex Flow Converter) Group : II Category : 1G Degree of Protection of Enclosure : IP67 Maximum Working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Tamb. : –29 to +60°C (Integral Type Vortex Flowmeter) –29 to +80°C (Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Process temp.: T4;135°C, T3;200°C, T2 (*);300°C, T1(*); 450°C (*: Use /HT version above 250°C) Electrical data: Supply and Output Circuit (SUPPLY + and -, PULSE + and -); Maximum Input Voltage Ui: 30 V Maximum Input Current Ii: 165 mA Maximum Input Power Pi: 0.9 W Internal Capacitance Ci: 6nF Internal Inductance Li: 0.15mH For connection of DYA and DY-N Maximum capacitance of cable: 160nF Electrical connection : ANSI 1/2NPT female, ISO M20 × 1.5 female.	KS1

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Item	Specification	Code
ATEX	ATEX Type n Approval (Note 3) Applicable Standard: EN60079-15, EN60079-0 Type of Protection : Ex nL IIC T4...T1 Gc (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Ex nL IIC T4 Gc (Remote Type Vortex Flow Converter) Group : II Category : 3G Degree of Protection of Enclosure: IP66/IP67 Ambient Temperature: –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) : –40 to +60°C (Remote Type Vortex Flow Converter without indicator) : –30 to +60°C (Remote Type Vortex Flow Converter with indicator) Process Temp.: T4(–29 to 135°C), T3(–29 to 200°C), T2(–29 to 300°C), T1(–29 to 450°C) (Use /HT version above 250°C) Electrical data: Supply and Output Circuit (SUPPLY + and -, PULSE + and -); Maximum Input Voltage Ui: 30 V Internal Capacitance Ci: 6nF Internal Inductance Li: 0.15mH Electrical Connection : ANSI 1/2 NPT female, ISO M20 X 1.5 female.	KN2
Canadian Standards Association (CSA)	CSA Explosion proof Approval Applicable Standard: C22.1, C22.2 No. 0, C22.2 No. 04, C22.2 No. 0.5, C22.2 No. 25, C22.2 No. 30, C22.2 No. 94, C22.2 No. 142, C22.2 No. 61010-1, ANSI/ISA-12.27.01 Type of Protection : Explosionproof for Class I, Groups B, C and D; Class II, Groups E, F, and G; Class III. For Class I, Division 2 location: "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED" Enclosure : Type 4X Temperature Code : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Amb.Temp. : –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Process temp. : T6;85°C, T5;100°C, T4;135°C, T3;200°C, T2;300°C, T1; 450°C Maximum working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Electrical Connection: ANSI 1/2 female (Special)	CF1
	CSA Explosion proof Approval • The approval specification is the same with /CF1. • Process Sealing Certification Dual Seal Certified by CSA to the requirement of ANSI/ISA 12.27.01 No additional sealing required	CF11
	CSA Intrinsically safe Approval (Note 2) Applicable Standard: C22.2 No. 0, C22.2 No. 0.4, C22.2 No. 157, C22.2 No. 213, C22.2 No. 1010.1, CAN/CSA-E60079-0, CAN/CSA-E60079-11, CAN/CSA-E60079-15, ANSI/ISA-12.27.01 Type of Protection : Ex ia IIC T4...T1 and Ex nC IIC T4...T1(Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Ex ia IIC T4 and Ex nC IIC T4(Remote Type Vortex Flow Converter) Temperature Class.: T4;135°C, T3;200°C, T2;300°C, T1;450°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Amb. Temp. : –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) –40 to +60°C (Remote Type Vortex Flow Converter) Amb. Hum. : 0 to 100%RH (No condensation) Degree of Protection of Enclosure:IP67 Electrical Parameters:Ui=30Vdc, Ii=165mAdc, Pi=0.9W, Ci=12nF, Li=0.15mH. Intrinsically Safe for Class I, II, III, DIV.1, Groups A, B, C, D, E, F and G Non-incendive for Class I, II, DIV.2, Groups A, B, C, D, E, F and G, ClassIII, DIV.1. Temperature Code : T4;135°C, T3; 200°C, T2; 300°C, T1; 450°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T4;135°C (Remote Type Vortex Flow Converter) Enclosure : Type 4X Electrical Parameter:Vmax =30Vdc, Imax =165mAdc, Pmax = 0.9W, Ci =12nF, Li = 0.15mH. Maximum working Pressure : 16MPa (DY015 to DY200) 5MPa (DY250 and DY300) Electrical Connection: ANSI 1/2 NPT female	CS1
	CSA Intrinsically safe Approval • The approval specification is the same with /CS1. • Process Sealing Certification Dual Seal Certified by CSA to the requirement of ANSI/ISA 12.27.01 No additional sealing required	CS11

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Item	Specification	Code
IECEx Certification	IECEx Flameproof Approval (Note 3) Applicable Standard: IEC60079-0, IEC60079-1 Type of Protection: Ex d IIC T6...T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) Ex d IIC T6 Gb (Remote Type Vortex Flow Converter) Temperature Class : T6...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) T6 (Remote Type Vortex Flow Converter) Process Temp. : T6(–29 to 80°C), T5(–29 to 100°C), T4(–29 to 135°C), T3(–29 to 200°C), T2(–29 to 300°C), T1(–29 to 450°C) (USE /HT version above 250°C) Ambient Temperature: –29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector) : –40 to +60°C (Remote Type Vortex Flow Converter without indicator) : –30 to +60°C (Remote Type Vortex Flow Converter with indicator) Ambient Humidity: 0 to 100% RH Electrical connection: ANSI 1/2 NPT female, ISO M20 × 1.5 female	SF2
Standards Association of Australia (SAA)	SAA intrinsically Safe Approval (Note 2) SAA Type n Approval Applicable Standard: AS 2380.1, AS2380.7, AS2380.9 Type of Protection: Ex ia IIC T4 IP67 (Integral Type Vortex Flowmeter, Remote Type Vortex Flow Detector and Remote Type Vortex Flow Converter) Maximum Input Voltage (Ui)=30Vdc Maximum Input Current (Ii)=165mAdc Maximum Input Power (Pi)=0.9W Internal Capacitance (Ci)=37nF Internal Inductance (Li)=0mH Ambient Temperature: –20 to +60°C Type of Protection: Ex n IIC T4 IP67 (Integral Type Vortex Flowmeter, Remote Type Vortex Flow Detector and Remote Type Vortex Flow Converter) Hazardous Area: Class I, Zone 2 Maximum Input Voltage (Ui)=30Vdc Ambient Temperature: –20 to +80°C Electrical connection: ANSI 1/2 NPT female, ISO M20 × 1.5 female	SS1

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(Note 1) The flameproof packing adapter (/G11,G12) is necessary except the electrical conduit work. In case the ambient temperature exceeds 50deg.C, use heat resistant cables with maximum allowable temperature of 70deg.C or above.

(Note 2) For intrinsically safe approval, use the barrier certified by the testing laboratories (BARD-400 is not applicable).

(Note 3) ATEX Flameproof Approval (/KF2), ATEX Type n Approval (/KN2) and IECEx Flameproof Approval (/SF2) can not combine with Cryogenic Version (/LT).

12.5 Sizing

The following items are the basic specifications.
In case of the definite sizing, it is necessary to check by the sizing software.

■ Measurable minimum flow velocity

Table 12.5.1 Relationship between Minimum Velocity and Density (In case of "Gas, Steam", Use the Large of the Two Values)

Model Code			Liquid		Gas, Steam	Steam
			General Type, Cryogenic Type (unit: m/s) (Note)	High Process Temperature Version (unit: m/s)	General Type, Cryogenic Type (unit: m/s) (Note)	High Process Temperature version (unit: m/s)
DY015	DY025-/R1	DY040-/R2	$\sqrt{250/\rho}$	—	$\sqrt{80/\rho}$ or 3	—
DY025	DY040-/R1	DY050-/R2	$\sqrt{122.5/\rho}$	$\sqrt{490/\rho}$	$\sqrt{45/\rho}$ or 2	$\sqrt{125/\rho}$ or 2
DY040	DY050-/R1	DY080-/R2	$\sqrt{90/\rho}$	$\sqrt{302.5/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{90.3/\rho}$ or 2
DY050	DY080-/R1	DY100-/R2	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
DY080	DY100-/R1	DY150-/R2	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
DY100	DY150-/R1	DY200-/R2	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 2	$\sqrt{61.3/\rho}$ or 2
DY150	DY200-/R1	—	$\sqrt{90/\rho}$	$\sqrt{160/\rho}$	$\sqrt{31.3/\rho}$ or 3	$\sqrt{61.3/\rho}$ or 3
DY200	—	—	$\sqrt{122.5/\rho}$	$\sqrt{202.5/\rho}$	$\sqrt{45/\rho}$ or 3	$\sqrt{80/\rho}$ or 3
DY250	—	—	$\sqrt{160/\rho}$	$\sqrt{360/\rho}$	$\sqrt{61.3/\rho}$ or 3	$\sqrt{125/\rho}$ or 3
DY300	—	—	$\sqrt{160/\rho}$	$\sqrt{360/\rho}$	$\sqrt{61.3/\rho}$ or 3	$\sqrt{125/\rho}$ or 3

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ρ : Density at operating conditions (kg/m^3)
Liquid density is 400 up to 2000kg/m^3
(Note) Reduced bore type (/R1 and /R2) are not available to combine for Cryogenic type (/LT.)

■ Range of measurable flow velocity

Table 12.5.2 Range of measurable flow velocity

Fluid	Model Code			Minimum flow velocity	Maximum flow velocity (Note)
Liquid	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained from Table 12.5.1" or "flow velocity at Reynolds number of 5000", whichever is greater. For liquid Reynolds number of 5000 : See P.12-17 "Calculation formula".	10 m/s
Gas, Steam	DY015 up to DY300	DY025-/R1 up to DY200-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained from Table 12.5.1" or "flow velocity at Reynolds number of 5000", whichever is greater. For Gas and steam Reynolds number of 5000 : See P.12-17 "Calculation formula".	80 m/s

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When the flow velocity is lower than minimum, both the analog output and the pulse output is displayed as zero "0".

■ Range of fixed accuracy flow velocity

Table 12.5.3 Range of fixed accuracy flow velocity

Fluid	Model Code			Minimum flow velocity	Maximum flow velocity (Note)
Liquid	DY015 up to DY100	DY025-/R1 up to DY150-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained from Table 12.5.1" or "flow velocity at Reynolds number of 20000", whichever is greater. For liquid Reynolds number of 20000 : The value is four times velocity value in P.12-17 "Calculation formula".	10 m/s
	DY150 up to DY300	DY200-/R1	—	"flow velocity obtained from Table 12.5.1" or "flow velocity at Reynolds number of 40000", whichever is greater. For liquid Reynolds number of 40000 : The value is eight times velocity value in P.12-17 "Calculation formula".	
Gas, Steam	DY015 up to DY100	DY025-/R1 up to DY150-/R1	DY040-/R2 up to DY200-/R2	"flow velocity obtained fromTable 12.5.1" or "flow velocity at Reynolds number of 20000", whichever is greater. For gas and steam Reynolds number of 20000 : See P.12-17 "Calculation formula".	80 m/s
	DY150 up to DY300	DY200-/R1	—	"flow velocity obtained fromTable 12.5.1" or "flow velocity at Reynolds number of 40000", whichever is greater. For gas and steam Reynolds number of 40000 : See P.12-17 "Calculation formula".	

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■ Detailed Accuracy (for Table 12.5.3 Range of Fixed Accurancy Flow Velocity.)

Volumetric flow rate at operation condition ***Accuracy: of Reading**

	Model Code	General Type	Multi-Variable Type (/MV)	Reduced Bore Type (/R1)	Reduced Bore Type (/R2)
Liquid	DY015	± 1.0% (20000 ≦ Re < 2000*D) ± 0.75% (2000*D ≦ Re)			
	DY025	± 1.0% (20000 ≦ Re < 1500*D) ± 0.75% (1500*D ≦ Re)	± 1.0% (20000 ≦ Re < 1500*D) ± 0.75% (1500*D ≦ Re)	± 1.0% (20000 ≦ Re)	
	DY040 DY050 DY080 DY100	± 1.0% (20000 ≦ Re < 1000*D) ± 0.75% (1000*D ≦ Re)	± 1.0% (20000 ≦ Re < 1000*D) ± 0.75% (1000*D ≦ Re)		± 1.0% (20000 ≦ Re)
	DY150	± 1.0% (40000 ≦ Re < 1000*D) ± 0.75% (1000*D ≦ Re)	± 1.0% (40000 ≦ Re < 1000*D) ± 0.75% (1000*D ≦ Re)		
	DY200			± 1.0% (40000 ≦ Re)	
	DY250 DY300				
Gas, Steam	DY015 DY025 DY040 DY050 DY080 DY100 DY150 DY200 DY250 DY300	± 1.0% (Velocity 35m/s or less) ± 1.5% (Velocity 35m/s up to 80m/s)	± 1.0% (Velocity 35m/s or less) ± 1.5% (Velocity 35m/s up to 80m/s)	± 1.0% (Velocity 35m/s or less) ± 1.5% (Velocity 35m/s up to 80m/s)	± 1.0% (Velocity 35m/s or less) ± 1.5% (Velocity 35m/s up to 80m/s)

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D : Inner diameter of digitalYEWFLO detecter (mm)
Re: Reynolds number (non unit)
Note: This table shows the accuracy of pulse output. In case of analog output, add up ± 0.1% of full scale to the values mentioned above.
Guarantee conditions of liquid volumetric flow rate: the accuracy of a product before shipment in our water actual test facility. Totalized value of 2000 pulse or greater, straight pipe length: upper 10D or greater, lower 5D or greater, Fluid temp. 20 ± 10degC
Gas, Steam : The accuracy which is add up from liquid measurement accuracy. The accuracy is confirmed by actual measured value of typical nominal size.

Mass flow or Volumetric flow rate at Normal/Standard condition:
for Multi-Variable Type and combination of Multi-Variable Type and Reduced Bore ***Accuracy: of Reading**

	Model Code	Multi-Variable Type (/MV)	Multi-Variable Type (/MV)/ Reduced Bore Type (/R1)	Multi-Variable Type (/MV)/ Reduced Bore Type (/R2)
Liquid	DY025	± 2.0% (20000 ≦ Re < 1500*D) ± 1.5% (1500*D≦ Re)		
	DY040 DY050 DY080 DY100	± 2.0% (20000 ≦ Re < 1000*D) ± 1.5% (1000*D≦ Re)	± 2.0% (20000 < Re)	± 2.0% (20000 < Re)
	DY150 DY200	± 2.0% (40000 ≦ Re < 1000*D) ± 1.5% (1000*D≦ Re)	± 2.0% (40000 < Re)	
Gas, Steam	DY015 DY025 DY040 DY050 DY080 DY100 DY150 DY200	± 2.0% (Velocity 35m/s or less) ± 2.5% (Velocity 35m/s up to 80m/s)	± 2.0% (Velocity 35m/s or less) ± 2.5% (Velocity 35m/s up to 80m/s)	± 2.0% (Velocity 35m/s or less) ± 2.5% (Velocity 35m/s up to 80m/s)

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D : Inner diameter of digitalYEWFLO detecter (mm)
Re: Reynolds number (non unit)
Note: This table shows the accuracy of pulse output. In case of analog output, add up ± 0.1% of full scale to the values mentioned above.

■ Calculation formula

■ How to calculate volume flow rate at operating conditions.

- $Q_f = 3600 \times \upsilon \times S$ or $Q_f = \dfrac{\upsilon \times D^2}{354}$

■ How to calculate the velocity of a Reynolds number.

- $\upsilon = 5 \times \nu / D$ (Reynolds number of 5000)
- $\upsilon = 20 \times \nu / D$ (Reynolds number of 20000)
- $\upsilon = 40 \times \nu / D$ (Reynolds number of 40000)

however

- $Re = \dfrac{354 \times 10^3 \times Q_f}{\nu \times D}$ ····· (1)

- $\nu = \dfrac{\mu}{\rho_f} \times 10^3$ ····· (2)

Q_f : Volume flow rate at operating conditions (m^3/h)
D : Inner diameter of YEWFLO (mm)
S : Sectional area of YEWFLO(m^2)
υ : Flow velocity (m/s)
Re : Reynolds number (non unit)
ρ_f : Density at operating conditions (kg/m^3)
μ : Viscosity at operating conditions (mPa·s (cP))
ν : Kinematic viscosity at operating conditions ($10^{-6}m^2/s$(cSt))

■ Typical fluid example

Table 12.5.4 Range of Measurable Water Flow Rate

(At standard condition of 15°C, ρ = 1000 kg/m^3)

Model Code			Measurable Flow Rate in m^3/h	Range of Fixed Accuracy Flow Rate in m^3/h
DY015	DY025-/R1	DY040-/R2	0.30 up to 6	0.94 up to 6
DY025	DY040-/R1	DY050-/R2	0.65 up to 18	1.7 up to 18
DY040	DY050-/R1	DY080-/R2	1.3 up to 44	2.6 up to 44
DY050	DY080-/R1	DY100-/R2	2.2 up to 73	3.3 up to 73
DY080	DY100-/R1	DY150-/R2	4.3 up to 142	4.6 up to 142
DY100	DY150-/R1	DY200-/R2	7.5 up to 248	7.5 up to 248
DY150	DY200-/R1	—	17 up to 544	18 up to 544
DY200	—	—	34 up to 973	34 up to 973
DY250	—	—	60 up to 1506	60 up to 1506
DY300	—	—	86 up to 2156	86 up to 2156

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Table 12.5.5 Range of Measurable Air Flow Rate at Selected Process Pressures

Model Code			Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in Nm^3/h									
				0 MPa	0.1 MPa	0.2 MPa	0.4 MPa	0.6 MPa	0.8 MPa	1 MPa	1.5 MPa	2 MPa	2.5 MPa
DY015	DY025 -/R1	DY040 -/R2	min.	4.8(11.1)	6.7(11.1)	8.2(11.1)	10.5(11.1)	12.5	16.1	19.7	28.6	37.5	46.4
			max.	48.2	95.8	143	239	334	429	524	762	1000	1238
DY025	DY040 -/R1	DY050 -/R2	min.	11.0(19.5)	15.5(19.5)	19.0(19.5)	24.5	29.0	33.3	40.6	59.0	77.5	95.9
			max.	149	297	444	739	1034	1329	1624	2361	3098	3836
DY040	DY050 -/R1	DY080 -/R2	min.	21.8(30.0)	30.8	37.8	48.7	61.6	79.2	97	149	184	229
			max.	356	708	1060	1764	2468	3171	3875	5634	7394	9153
DY050	DY080 -/R1	DY100 -/R2	min.	36.2(38.7)	51	62.4	80.5	102	131	161	233	306	379
			max.	591	1174	1757	2922	4088	5254	6420	9335	12249	15164
DY080	DY100 -/R1	DY150 -/R2	min.	70.1	98.4	120	155	197	254	310	451	591	732
			max.	1140	2266	3391	5642	7892	10143	12394	18021	23648	29274
DY100	DY150 -/R1	DY200 -/R2	min.	122	172	211	272	334	442	540	786	1031	1277
			max.	1990	3954	5919	9847	13775	17703	21632	31453	41274	51095
DY150	DY200 -/R1	—	min.	268	377	485	808	1131	1453	1776	2583	3389	4196
			max.	4358	8659	12960	21559	30163	38765	47365	68867	90373	111875
DY200	—	—	min.	575	809	990	1445	2202	2599	3175	4617	6059	7501
			max.	7792	15482	23172	38549	53933	69313	84693	123138	161591	200046
DY250	—	—	min.	1037	1461	1788	2306	3127	4019	4911	7140	9370	11600
			max.	12049	23939	35833	59611	83400	107181	130968	190418	249881	309334
DY300	—	—	min.	1485	2093	2561	3303	4479	5756	7033	10226	13419	16612
			max.	17256	34286	51317	85370	119441	153499	187556	272699	357856	443017

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(1) At standard conditions STP (0˚C. 1atm).
(2) Pressure listed is at process temperature of 0˚C.
(3) Maximum flow rate is the lower of 80 m/s.
(4) Minimum values are determined from Table 12.5.3. The values in parenthesis show the minimum linear flow rates (Re = 20,000 or 40,000) when they are higher than the minimum measurable flow rate.

Table 12.5.6 Range of Measurable Saturated Steam Flow Rate at Selected Process Pressures

Model Code			Flow Rate Limits	Minimum and Maximum Measurable Flow Rate in kg/h									
				0.1 MPa	0.2 MPa	0.4 MPa	0.6 MPa	0.8 MPa	1 MPa	1.5 MPa	2 MPa	2.5 MPa	3 MPa
DY015	DY025 -/R1	DY040 -/R2	min.	5.8(10.7)	7.0(11.1)	8.8(11.6)	10.4(12.1)	11.6(12.3)	12.8	15.3	19.1	23.6	28.1
			max.	55.8	80	129	177	225	272	390	508	628	748
DY025	DY040 -/R1	DY050 -/R2	min.	13.4(18.9)	16.2(20.0)	20.5	24.1	27.1	30	36	41	49	58
			max.	169.7	247.7	400	548	696	843	1209	1575	1945	2318
DY040	DY050 -/R1	DY080 -/R2	min.	26.5(29.2)	32	40.6	47.7	53.8	59	72	93	116	138
			max.	405	591	954	1310	1662	2012	2884	3759	4640	5532
DY050	DY080 -/R1	DY100 -/R2	min.	44.0	53	67.3	79	89	98	119	156	192	229
			max.	671	979	1580	2170	2753	3333	4778	6228	7688	9166
DY080	DY100 -/R1	DY150 -/R2	min.	84.9	103	130	152	171	189	231	300	371	442
			max.	1295	1891	3050	4188	5314	6435	9224	12024	14842	17694
DY100	DY150 -/R1	DY200 -/R2	min.	148	179	227	267	300	330	402	524	647	772
			max.	2261	3300	5326	7310	9276	11232	16102	20986	25907	30883
DY150	DY200 -/R1	—	min.	324	392	498	600	761	922	1322	1723	2127	2536
			max.	4950	7226	11661	16010	20315	24595	35258	45953	56729	67624
DY200	—	—	min.	697	841	1068	1252	1410	1649	2364	3081	3803	4534
			max.	8851	12918	20850	28627	36325	43976	63043	82165	101433	120913
DY250	—	—	min.	1256	1518	1929	2260	2546	2801	3655	4764	5882	7011
			max.	13687	19977	32243	44268	56172	68005	97489	127058	156854	186978
DY300	—	—	min.	1799	2174	2762	3236	3646	4012	5235	6823	8423	10041
			max.	19602	28609	46175	63397	80445	97390	139614	181960	224633	267772

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(1) Maximum flow rate is the lower of 80 m/s.
(3) Minimum values are determined from Table 12.5.3. The values in parenthesis show the minimum linear flow rates (Re = 20,000 or 40,000) when they are higher than the minimum measurable flow rate.

■ Reference

Table 12.5.7 Inner Diameter and Nominal value

Model Code		Inner Diameter mm	Nominal K-Factor Pulse/L	Nominal Pulse Rate	
				Hz/m/s	Hz/m³/h
DY015	DY025-/R1	14.6	376	62.7	104
DY025	DY040-/R1	25.7	65.6	35.5	19.1
DY040	DY050-/R1	39.7	18.7	23.1	5.19
DY050	DY080-/R1	51.1	8.95	18.3	2.49
DY080	DY100-/R1	71.0	3.33	13.2	0.925
DY100	DY150-/R1	93.8	1.43	9.88	0.397
DY150	DY200-/R1	138.8	0.441	6.67	0.123
DY200	—	185.6	0.185	5.00	0.0514
DY250	—	230.8	0.0966	4.04	0.0268
DY300	—	276.2	0.0563	3.37	0.0156

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■ Pressure Loss

Calculation of pressure loss for general type

obtained from the following equations.

$\Delta P = 108 \times 10^{-5} \cdot \rho_f \cdot \upsilon^2$ ····· (1)

or

$\Delta P = 135 \times \rho_f \cdot \frac{Q_f^2}{D^4}$ ····· (2)

where,

ΔP : Pressure loss (kPa)
ρ_f : Density at operating condition (kg/m³)
υ : Flow velocity (m/s)
Q_f : Actual flow rate (m³/h)
D : Internal Diameter of detector (mm)

(Example)

DY050, hot water: 80°C, flowrate: 30 m³/h

1. Since the density of water at 80°C is 972 kg/m³, substitute this value in equation (2):

$\Delta P = 135 \times 972 \times 30^2 / 51.1^4$
$= 17.3$ kPa

2. Obtain the pressure loss using equation (1). The flow velocity when the flow rate is 30 m³/h is given by:

$\upsilon = 354 \times Q_f / D^2 = \frac{354 \times 30}{51.1^2} = 4.07$ m/s

Therefore, substitute this value in equation (1):

$\Delta P = 108 \times 10^{-5} \times 972 \times 4.07^2$
$= 17.3$ kPa

Calculation of pressure loss for reduced bore type (Option code: /R1)

obtained from the following equations.

$\Delta P = 124 \times 10^{-5} \times \rho_f \times \upsilon^2$ ····· (3)

or

$\Delta P = 155 \times \rho_f \times Q_f^2 / D^4$ ····· (4)

(Example)

DY040-/R1, hot water: 50 deg C flowrate: 10 m³/h

1. Since the density of water at 50 deg C is 992 kg/cm³, substitute this value in equation (4):

$\Delta P = 155 \times 992 \times 10^2 / 25.7^4$
$= 35.3$ kPa

2. Obtain by using equation (3). The flow velocity when the flow rate is 10 m3/h is given by:

$\upsilon = 354 \times Q_f \times / D^2 = 354 \times 10 \times 25.7^2$
$= 5.4$ m/s

Therefore, substitute this value in equation (3):

$\Delta P = 124 \times 10^{-5} \times 992 \times 5.4^2$
$= 35.3$ kPa

Calculation of pressure loss for reduced bore type (Option code: /R2)

obtained from the following equations.

$\Delta P = 138 \times 10^{-5} \cdot \rho_f \cdot \upsilon^2$ ····· (5)

or

$\Delta P = 173 \times \rho_f \cdot \frac{Q_f^2}{D^4}$ ····· (6)

(Example)

DY050-/R2, hot water: 50 deg C, flowrate: 15 m³/h

1. Since the density of water at 50 deg C is 992 kg/cm³, substitute this value in equation (6):

$\Delta P = 173 \times 992 \times 15^2 / 25.7^4$
$= 88.5$ kPa

2. Obtain by using equation (5). The flow velocity when the flow rate is 20m³/h is given by:

$\upsilon = 354 \times Q_f / D^2 = \frac{354 \times 15}{25.7^2} = 8.0$ m/s

Therefore, substitute this value in equation (5):

$\Delta P = 138 \times 10^{-5} \times 992 \times 8.0^2$
$= 88.5$ kPa

■ Cavitation

(Minimum Back Pressure, Liquid service only):

Cavitation occurs when the flow line pressure is low and flow velocity is high during fluid measurement, preventing correct measurement of flow rate. The optimum line pressure can be obtained from the following equation.

$P = 2.7 \cdot \Delta P + 1.3 \cdot Po$ ····· (5)

Where,

P : Line pressure, 2 to 7 times as large as internal diameter on downstream of flowmeter body surface. (kPa absolute).
ΔP : Pressure loss (kPa). Refer to the item above.
Po : Saturation liquid vapor pressure at operating temperature (kPa absolute).

(Example) Confirmation of presence of cavitation

Suppose that the line pressure is 120 kPa abs and the flow rate scale is 0 to 30 m³/h. It is only necessary to confirm the pressure at the maximum flow rate ; therefore, the saturated steam pressure of water at 80°C is as follows from the table of saturated steam pressures:

Po = 47.4 kPa abs

Therefore, substitute this value in equation (5):

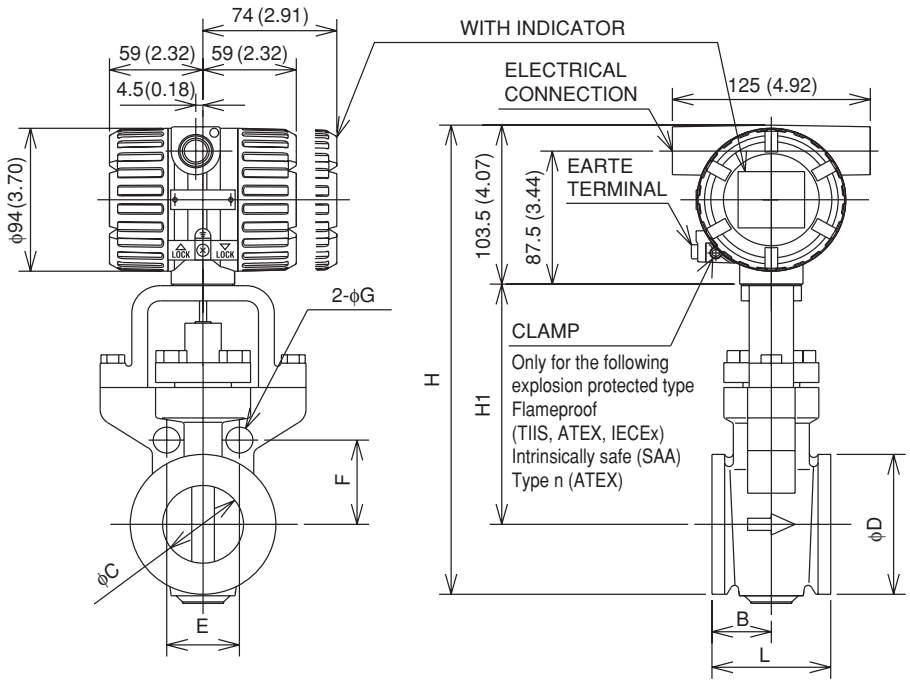
$P = 2.7 \times 17.3 + 1.3 \times 47.4$
$= 108.3$ kPa abs

Since the operating pressure of 120 kPa abs is higher than 108.3 kPa abs, no cavitation occurs.

12.6 External Dimensions

■ Wafer type (DY015 up to DY100)

Unit: mm
(approx. inch)



TYPE	INTEGRAL/REMOTE													
CODE	DY015 (15mm,½in)							DY025 (25mm,1in)						
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4
L	70 (2.76)							70 (2.76)						
B	35 (1.38)							35 (1.38)						
C	14.6 (0.57)							25.7 (1.01)						
D	35.1 (1.38)							50.8 (2.00)						
H	248 (9.76)							258 (10.16)						
H1	127 (5.00)							129 (5.08)						
E	49.5 (1.95)	49.5 (1.95)	56.6 (2.23)	42.7 (1.68)	47.1 (1.85)	47.1 (1.85)	46 (1.81)	63.6 (2.50)	63.6 (2.50)	67.2 (2.65)	56 (2.21)	62.9 (2.48)	62.9 (2.48)	60.1 (2.37)
F	24.7 (0.97)	24.7 (0.97)	28.3 (1.11)	21.4 (0.84)	23.5 (0.93)	23.5 (0.93)	23 (0.91)	31.8 (1.25)	31.8 (1.25)	33.6 (1.32)	28 (1.10)	31.4 (1.24)	31.4 (1.24)	30.1 (1.19)
G	13 (0.51)	13 (0.51)	17 (0.67)	14 (0.55)	14 (0.55)	14 (0.55)	13 (0.51)	17 (0.67)	17 (0.67)	17 (0.67)	14 (0.55)	17 (0.67)	17 (0.67)	13 (0.51)
WEIGHT kg	2.8 (6.17lb)							3.7 (8.16lb)						

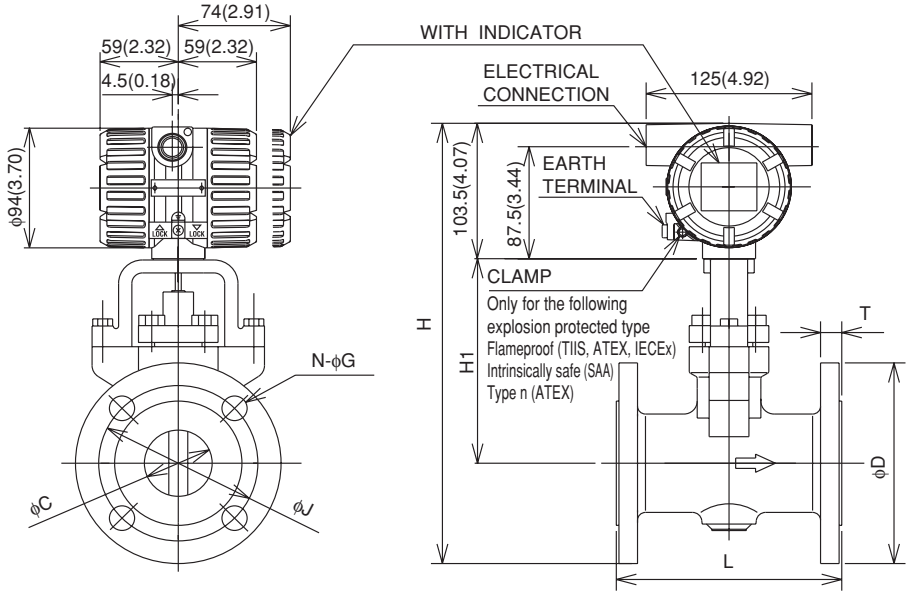
TYPE	INTEGRAL/REMOTE													
CODE	DY040 (40mm,1½in)							DY050 (50mm,2in)						
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AP4 AA4	AD1 - AD4
L	70 (2.76)							75 (2.95)						
B	35 (1.38)							37.5 (1.48)						
C	39.7 (1.56)							51.1 (2.01)						
D	73 (2.87)							92 (3.62)						
H	276 (10.87)							307.5 (12.11)						
H1	136 (5.35)							158 (6.22)						
E	74.2 (2.92)	74.2 (2.92)	84.9 (3.34)	69.7 (2.74)	80.8 (3.18)	80.8 (3.18)	77.8 (3.06)	(Note 3)	45.9 (1.81)	49.8 (1.96)	(Note 3)	48.6 (1.91)	48.6 (1.91)	(Note 3)
F	37.1 (1.46)	37.1 (1.46)	42.4 (1.67)	34.8 (1.37)	40.4 (1.59)	40.4 (1.59)	38.9 (1.53)	(Note 3)	55.4 (2.18)	60.1 (2.36)	(Note 3)	58.7 (2.31)	58.7 (2.31)	(Note 3)
G	17 (0.67)	17 (0.67)	21 (0.83)	14 (0.55)	20 (0.79)	20 (0.79)	17 (0.67)	(Note 3)	17 (0.67)	17 (0.67)	(Note 3)	17 (0.67)	17 (0.67)	(Note 3)
WEIGHT kg	4.3 (9.48lb)							6.0 (13.23lb)						

TYPE	INTEGRAL/REMOTE															
CODE	DY080 (80mm,3in)								DY100 (100mm,4in)							
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4
L	100 (3.94)								120 (4.72)							
B	40 (1.57)								50 (1.97)							
C	71 (2.80)								93.8 (3.69)							
D	127 (5.00)								157.2 (6.19)							
H	342 (13.47)								372 (14.65)							
H1	175 (6.89)								190 (7.48)							
E	57.4 (2.26)	61.2 (2.41)	65.1 (2.56)	(Note 3)	64.4 (2.54)	64.4 (2.54)	61.2 (2.41)	61.2 (2.41)	67 (2.64)	70.8 (2.79)	78.5 (3.09)	72.9 (2.87)	76.6 (3.02)	82.6 (3.25)	68.9 (2.71)	72.7 (2.86)
F	69.3 (2.73)	73.9 (2.91)	78.5 (3.09)	(Note 3)	77.7 (3.06)	77.7 (3.06)	73.9 (2.91)	73.9 (2.91)	80.8 (3.18)	85.5 (3.37)	94.7 (3.73)	88 (3.46)	92.5 (3.64)	99.7 (3.93)	83.1 (3.27)	87.8 (3.46)
G	17 (0.67)	21 (0.83)	21 (0.83)	(Note 3)	20 (0.79)	20 (0.79)	17 (0.67)	17 (0.67)	17 (0.67)	21 (0.83)	23 (0.91)	17 (0.67)	20 (3.06)	23 (0.91)	17 (0.67)	21 (0.83)
WEIGHT kg	9.4 (20.73lb)								12.8 (28.22lb)							

(Note 1) Integral weight is the same as Remote.
(Note 2) In case of with Indicator, add 0.2kg.
(Note 3) The hole is not provided.
(Note 4) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

■ Flange type (DY015 up to DY100)

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																			
CODE		DY015 (15mm,½in)										DY025 (25mm,1in)									
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		130 (5.12)						160 (6.30)	130 (5.12)	140 (5.51)	160 (6.30)	150 (5.91)						190 (7.48)	150 (5.91)	170 (6.69)	190 (7.48)
C		14.6 (0.58)										25.7 (1.01)									
D		95 (3.74)	95 (3.74)	115 (4.53)	88.9 (3.50)	95.3 (3.75)	95.3 (3.75)	120.7 (4.75)	95 (3.74)	95.3 (3.75)	120.7 (4.75)	125 (4.92)	125 (4.92)	130 (5.12)	108 (4.25)	124 (4.88)	124 (4.88)	149.4 (5.88)	115 (4.53)	124 (4.88)	149.4 (5.88)
H		278 (10.94)	278 (10.94)	288 (11.34)	275 (10.83)	278 (10.94)	278 (10.94)	291 (11.46)	278 (10.94)	278 (10.94)	291 (11.46)	295 (11.61)	295 (11.61)	297.5 (11.91)	286.5 (11.28)	294.5 (11.59)	294.5 (11.59)	307 (12.09)	290 (11.42)	294.5 (11.59)	307 (12.09)
H1		127 (5.00)										129 (5.08)									
T		12 (0.47)	14 (0.55)	20 (0.79)	11.2 (0.44)	14.2 (0.56)	21 (0.83)	28.8 (1.13)	16 (0.63)	19.9 (0.78)	28.8 (1.13)	14 (0.55)	16 (0.63)	22 (0.87)	14.2 (0.56)	17.5 (0.69)	24 (0.94)	34.9 (1.37)	18 (0.71)	24 (0.94)	34.9 (1.37)
J		70 (2.76)	70 (2.76)	80 (7.15)	60.5 (2.38)	66.5 (2.62)	66.5 (2.62)	82.6 (3.25)	65 (2.56)	66.5 (2.62)	82.6 (3.25)	90 (3.54)	90 (3.54)	95 (3.74)	79.2 (3.12)	89 (3.50)	89 (3.50)	101.6 (4.00)	85 (3.35)	89 (3.50)	101.6 (4.00)
N		4 (0.16)										4 (0.16)									
G		15 (0.59)	15 (0.59)	19 (0.75)	15.7 (0.62)	15.7 (0.62)	15.7 (0.62)	22.4 (0.88)	14 (0.55)	15.7 (0.62)	22.4 (0.88)	19 (0.75)	19 (0.75)	19 (0.75)	15.7 (0.62)	19 (0.75)	19 (0.75)	25.4 (1.00)	14 (0.55)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	4.2	4.3	5.9	4.1	4.3	4.6	6.7	4.2	4.5	6.8	6.9	7.1	8.6	6.6	7.2	7.7	11.1	6.9	7.9	11.4
	lb	9.26	9.48	13.01	9.04	9.48	10.14	14.77	9.26	9.92	14.99	15.21	15.66	18.96	14.55	15.88	16.98	24.48	15.21	17.42	25.14

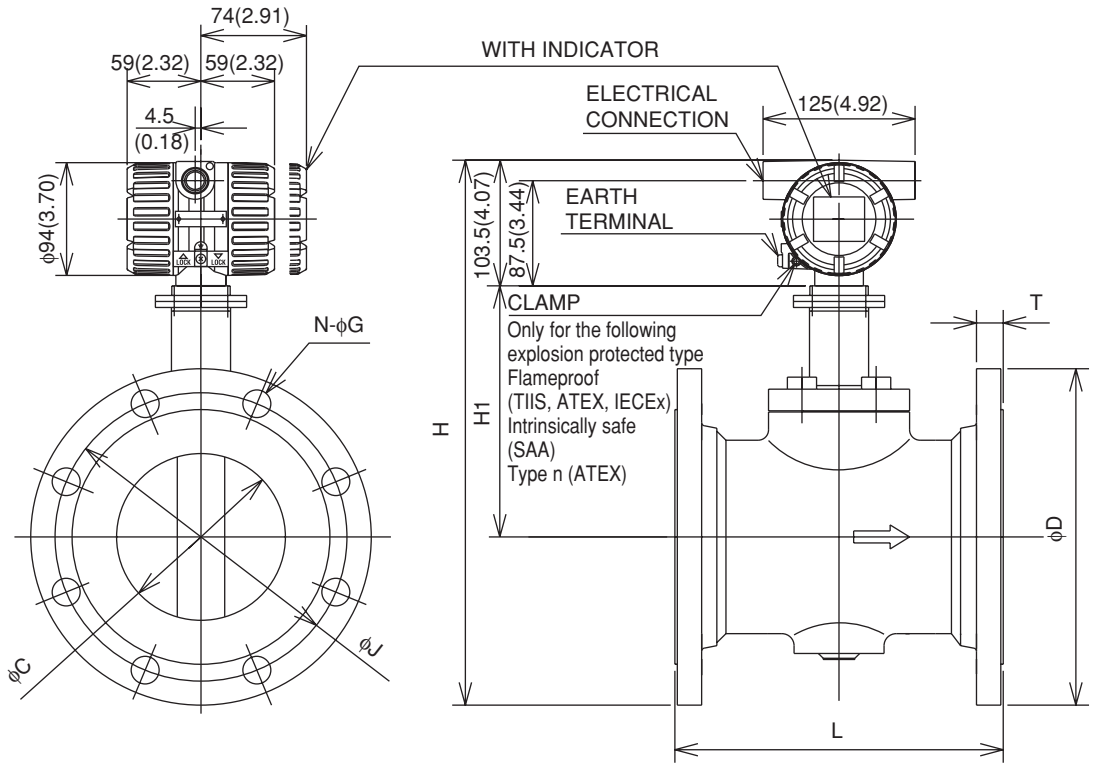
TYPE		INTEGRAL/REMOTE																			
CODE		DY040 (40mm,1½in)										DY050 (50mm, 2in)									
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		150 (5.91)						200 (7.87)	150 (5.91)	185 (7.28)	200 (7.87)	170 (6.69)						230 (9.06)	170 (6.69)	205 (8.07)	230 (9.06)
C		39.7 (1.56)										51.1 (2.01)									
D		140 (5.51)	140 (5.51)	160 (6.30)	127 (5.00)	155.4 (6.12)	155.4 (6.12)	177.8 (7.00)	150 (5.91)	155.4 (6.12)	177.8 (7.00)	155 (6.10)	155 (6.10)	165 (6.50)	152.4 (6.00)	165.1 (6.50)	165.1 (6.50)	215.9 (8.50)	165 (6.50)	165.1 (6.50)	215.9 (8.50)
H		309.5 (12.19)	309.5 (12.19)	319.5 (12.58)	303 (11.93)	317 (12.48)	317 (12.48)	328.5 (12.93)	314.5 (12.38)	317 (12.48)	328.5 (12.93)	339 (13.35)	339 (13.35)	344 (13.54)	337.5 (13.29)	344 (13.54)	344 (13.54)	369.5 (14.55)	344 (13.54)	344 (13.54)	369.5 (14.55)
H1		136 (5.35)										158 (6.22)									
T		16 (0.63)	18 (0.71)	26 (1.02)	17.5 (0.69)	20.6 (0.81)	28.8 (1.13)	38.2 (1.50)	18 (0.71)	28.8 (1.13)	38.2 (1.50)	16 (0.63)	18 (0.71)	26 (1.02)	19.1 (0.75)	22.4 (0.88)	31.8 (1.25)	44.5 (1.75)	20 (0.79)	33.3 (1.31)	46 (1.81)
J		105 (4.13)	105 (4.13)	120 (4.72)	98.6 (3.88)	114.3 (4.50)	114.3 (4.50)	124 (4.88)	110 (4.33)	114.3 (4.50)	124 (4.88)	120 (4.72)	120 (4.72)	130 (5.12)	120.7 (4.75)	127 (5.00)	127 (5.00)	165.1 (6.50)	125 (4.92)	127 (5.00)	165.1 (6.50)
N		4 (0.16)										4 (0.16)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)
G		19 (0.75)	19 (0.75)	23 (0.91)	15.7 (0.62)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	18 (0.71)	22.4 (0.88)	28.4 (1.12)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	25.4 (1.00)	18 (0.71)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	8.2	8.4	11.9	8.1	9.3	11.3	16.2	8.8	11.7	16.3	11.1	11.6	14.3	11.7	13.2	14.8	26.5	11.3	15.8	26.9
	lb	18.08	18.52	26.24	17.86	20.51	24.92	35.72	19.40	25.80	35.94	24.48	25.58	31.53	25.80	29.11	32.63	58.43	24.92	34.84	59.31

TYPE		INTEGRAL/REMOTE																					
CODE		DY080 (80mm, 3in)										DY100 (100mm, 4in)											
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5
L		200 (7.87)						245 (9.65)	200 (7.87)		235 (9.25)	250 (9.84)	220 (8.66)					240 (9.45)	280 (11.02)	220 (8.66)		270 (10.63)	285 (11.22)
C		71 (2.80)											93.8 (3.69)										
D		185 (7.28)	200 (7.87)	210 (8.27)	190.5 (7.50)	209.6 (8.25)	209.6 (8.25)	241.3 (9.50)	200 (7.87)	200 (7.87)	209.6 (8.25)	241.3 (9.50)	210 (8.27)	225 (8.90)	250 (9.84)	228.6 (9.00)	254 (10.00)	273 (10.75)	292.1 (11.50)	220 (8.66)	235 (9.25)	273 (10.75)	292.1 (11.50)
H		371 (14.61)	378.5 (14.90)	383.5 (15.10)	374 (14.72)	383.5 (15.10)	383.5 (15.10)	399 (15.71)	378.5 (14.90)	378.5 (14.90)	383.5 (15.10)	399 (15.71)	398.5 (15.69)	406 (15.98)	418.5 (16.48)	409 (16.10)	420.5 (16.56)	430 (16.93)	439.5 (17.30)	403.5 (15.89)	411 (16.18)	430 (16.93)	439.5 (17.30)
H1		175 (6.89)											190 (7.48)										
T		18 (0.71)	22 (0.87)	32 (1.26)	23.9 (0.94)	28.4 (1.12)	38.2 (1.50)	44.5 (1.75)	20 (0.79)	24 (0.95)	39.7 (1.56)	46 (1.81)	18 (0.71)	24 (0.95)	36 (1.42)	23.9 (0.94)	31.8 (1.25)	44.5 (1.75)	50.9 (2.00)	20 (0.79)	24 (0.95)	46 (1.81)	52.4 (2.06)
J		150 (5.91)	160 (6.30)	170 (6.69)	152.4 (6.00)	168.2 (6.62)	168 (6.61)	190.5 (7.50)	160 (6.30)	160 (6.30)	170 (6.69)	180 (7.09)	175 (6.89)	185 (7.28)	205 (8.07)	190.5 (7.50)	200.2 (7.88)	216 (8.50)	235 (9.25)	180 (7.09)	190 (7.48)	216 (8.50)	235 (9.25)
N		8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)										
G		19 (0.75)	23 (0.91)	23 (0.91)	19 (0.75)	22.4 (0.88)	22.4 (0.88)	25.4 (1.00)	18 (0.71)	18 (0.71)	22.4 (0.88)	25.4 (1.00)	19 (0.75)	23 (0.91)	25 (0.98)	19 (0.75)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	18 (0.71)	22 (0.87)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	17.4	20	25.4	20	23.8	25.4	35.7	19.4	20	27.1	36.3	22.8	26.8	38.1	27.4	35.9	50.8	55.9	23.2	27.4	52.8	56.6
	lb	38.37	44.10	56.01	44.10	52.48	56.01	78.72	42.78	44.10	59.76	80.04	50.27	59.09	84.01	60.42	79.16	112.01	123.26	51.16	60.42	116.42	124.80

(Note 1) Integral weight is the same as Remote
(Note 2) In the case of with Indicator, add 0.2 kg
(Note 3) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

■ Flange type (DY150 up to DY300)

Unit: mm
(approx. inch)



TYPE		INTEGRAL/REMOTE																					
CODE		DY150 (150mm, 6in)											DY200 (200mm, 8in)										
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1	BD2	BD3	BD4	CA4	CA5
L		270 (10.63)					310 (12.21)	336 (13.23)	270 (10.63)		325 (12.80)	340 (13.39)	310 (12.20)				370 (14.57)	386 (15.20)	310 (12.20)				375 (14.76)	390 (15.35)
C		138.8 (5.46)											185.6 (7.31)											
D		280 (11.02)	305 (12.01)	355 (13.98)	279.4 (11.00)	317.5 (12.50)	356 (14.02)	381 (15.00)	285 (11.22)	300 (11.81)	356 (14.02)	381 (15.00)	330 (12.99)	350 (13.78)	342.9 (13.50)	381 (15.00)	419.1 (16.50)	469.9 (18.50)	340 (13.39)	340 (13.39)	360 (14.17)	375 (14.76)	419.1 (16.50)	469.9 (18.50)
H	Shedder Bar Material: X	453 (17.83)	465 (18.31)	490 (19.29)	452 (17.80)	471 (18.54)	491 (19.33)	503 (19.80)	455 (17.91)	463 (18.23)	491 (19.33)	503 (19.80)	510 (20.08)	520 (20.47)	516 (20.31)	535 (21.06)	554 (21.81)	579 (22.80)	515 (20.28)	515 (20.28)	525 (20.67)	532 (20.94)	554 (21.81)	579 (22.80)
	Shedder Bar Material: B	460 (18.11)	472 (18.58)	497 (19.57)	459 (18.67)	478 (18.82)	498 (19.61)	510 (20.08)	462 (18.19)	470 (18.50)	498 (19.61)	510 (20.08)	517 (20.35)	527 (20.75)	523 (20.59)	542 (21.34)	561 (22.09)	586 (23.07)	522 (20.55)	522 (20.55)	532 (20.94)	539 (21.22)	561 (22.09)	586 (23.07)
H1	Shedder Bar Material: X	209 (8.23)											241 (9.49)											
	Shedder Bar Material: X	216 (8.50)											248 (9.76)											
T		22 (0.87)	28 (1.10)	44 (1.73)	25.4 (1.00)	36.6 (1.44)	54.4 (2.14)	62 (2.44)	22 (0.87)	28 (1.10)	55.7 (2.19)	63.6 (2.50)	22 (0.87)	30 (1.18)	28.4 (1.12)	41.1 (1.62)	62 (2.44)	69.9 (2.75)	24 (0.95)	24 (0.95)	30 (1.18)	34 (1.34)	63.6 (2.50)	71.4 (2.81)
J		240 (9.45)	260 (10.24)	295 (11.61)	241.3 (9.50)	269.7 (10.62)	292 (11.50)	317.5 (12.50)	240 (9.45)	250 (9.84)	292 (11.50)	317.5 (12.50)	290 (11.42)	305 (12.01)	298.5 (11.75)	330.2 (13.00)	349.3 (13.75)	393.7 (15.50)	295 (11.61)	295 (11.61)	310 (12.20)	320 (12.60)	349.3 (13.75)	393.7 (15.50)
N		8 (0.31)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)
G		23 (0.91)	25 (0.98)	33 (1.30)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	31.8 (1.25)	22 (0.87)	26 (1.02)	28.4 (1.12)	31.8 (1.25)	23 (0.91)	25 (0.98)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	38.1 (1.50)	22 (0.87)	22 (0.87)	26 (1.02)	30 (1.18)	31.8 (1.25)	38.1 (1.50)
WEIGHT	kg	33.4	43.4	76.4	36.4	54.4	84.4	106	33.4	42.9	90	107	45.4	52.4	55.4	80.4	136	182	46.3	46.3	53.6	55.9	139	183
	lb	73.65	95.70	168.46	80.26	119.95	186.10	233.73	73.65	94.59	198.45	235.94	100.11	115.54	122.16	177.28	299.88	401.31	102.09	102.09	118.19	123.26	306.52	403.52

TYPE		INTEGRAL/REMOTE							
CODE		DY250 (250mm, 10in)				DY300 (300mm, 12in)			
PROCESS CONNECTION		BJ1	BJ2	BA1 BS1	BA2 BS2	BJ1	BJ2	BA1 BS1	BA2 BS2
L		370 (14.57)				400 (15.75)			
C		230.8 (9.09)				276.2 (10.87)			
D		400 (15.75)	430 (16.93)	406.4 (16.00)	444.5 (17.50)	445 (17.52)	480 (18.90)	482.6 (19.00)	520.7 (20.50)
H		581 (22.87)	596 (23.46)	584 (22.99)	603 (23.74)	633 (24.92)	651 (25.63)	652 (25.67)	671 (26.42)
H1		277 (10.91)				307 (12.09)			
T		24 (0.94)	34 (1.34)	30.2 (1.19)	47.8 (1.88)	24 (0.94)	36 (1.42)	31.8 (1.25)	50.8 (2.00)
J		355 (13.98)	380 (14.96)	362 (14.25)	387.4 (15.25)	400 (15.75)	430 (16.93)	431.8 (17.00)	450.9 (17.75)
N		12 (0.47)	12 (0.47)	12 (0.47)	16 (0.63)	16 (0.63)	16 (0.63)	12 (0.47)	16 (0.63)
G		25 (0.98)	27 (1.06)	25.4 (1.00)	28.5 (1.12)	25 (0.98)	27 (1.06)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	78	100	90	125	100	128	140	178
	lb	171.99	220.50	198.45	275.63	220.50	282.24	308.70	392.49

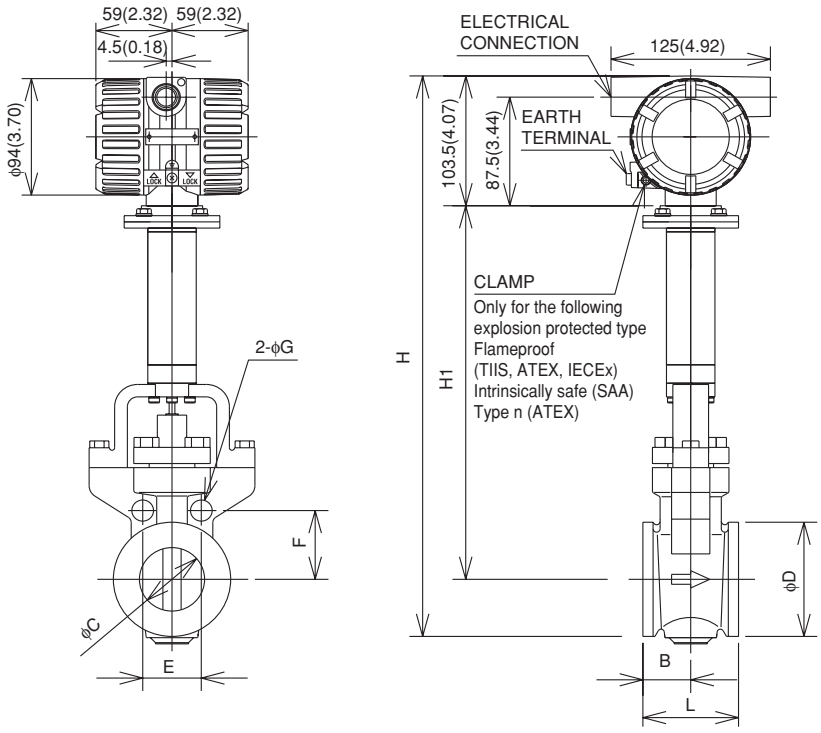
(Note 1) Integral weight is the same as Remote
(Note 2) In case of with indicator, add 0.2kg
(Note 3) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

■ **High Process Temperature Version (/HT): DY025-/HT up to DY100-/HT**

■ **Cryogenic Version (/LT): DY015-/LT up to DY100-/LT**

■ **Wafer type**

Unit: mm
(approx. inch)



TYPE	Only for REMOTE						
CODE	DY015 (15mm,½in) Only for /LT						
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4
L	70 (2.76)						
B	35 (1.38)						
C	14.6 (0.57)						
D	35.1 (1.38)						
H	391 (15.39)						
H1	270 (10.63)						
E	49.5 (1.95)	49.5 (1.95)	56.6 (2.23)	42.7 (1.68)	47.1 (1.85)	47.1 (1.85)	46 (1.81)
F	24.7 (0.97)	24.7 (0.97)	28.3 (1.11)	21.4 (0.84)	23.5 (0.93)	23.5 (0.93)	23 (0.91)
G	13 (0.51)	13 (0.51)	17 (0.67)	14 (0.55)	14 (0.55)	14 (0.55)	13 (0.51)
WEIGHT kg	3.2 (7.06lb)						

TYPE	Only for REMOTE																			
CODE	DY025 (25mm,1in) /LT, /HT							DY040 (40mm,1½in) /LT, /HT							DY050 (50mm,2in) /LT, /HT						
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD4
L	70 (2.76)							70 (2.76)							75 (2.95)						
B	35 (1.38)							35 (1.38)							37.5 (1.48)						
C	25.7 (1.01)							39.7 (1.56)							51.1 (2.01)						
D	50.8 (2.00)							73 (2.87)							92 (3.62)						
H	401 (15.79)							419 (16.50)							450.5 (17.74)						
H1	272 (10.71)							279 (10.98)							301 (11.85)						
E	63.6 (2.50)	63.6 (2.50)	67.2 (2.65)	56 (2.20)	62.9 (2.48)	62.9 (2.48)	60.1 (2.37)	74.2 (2.92)	74.2 (2.92)	84.9 (3.34)	69.7 (2.74)	80.8 (3.18)	80.8 (3.18)	77.8 (3.06)	(Note 1)	45.9 (1.81)	49.8 (1.96)	(Note 1)	48.6 (1.91)	48.6 (1.91)	(Note 1)
F	31.8 (1.25)	31.8 (1.25)	33.6 (1.32)	28 (1.10)	31.4 (1.24)	31.4 (1.24)	30.1 (1.19)	37.1 (1.46)	37.1 (1.46)	42.4 (1.67)	34.8 (1.37)	40.4 (1.59)	40.4 (1.59)	38.9 (1.53)	(Note 1)	55.4 (2.18)	60.1 (2.37)	(Note 1)	58.7 (2.31)	58.7 (2.31)	(Note 1)
G	17 (0.67)	17 (0.67)	17 (0.67)	14 (0.55)	17 (0.67)	17 (0.67)	13 (0.51)	17 (0.67)	17 (0.67)	21 (0.83)	14 (0.55)	20 (0.79)	20 (0.79)	17 (0.67)	(Note 1)	17 (0.67)	17 (0.67)	(Note 1)	17 (0.67)	17 (0.67)	(Note 1)
WEIGHT kg	4.1 (9.04lb)							4.7 (10.36lb)							6.4 (14.11lb)						

TYPE	Only for REMOTE															
CODE	DY080 (80mm,3in) /LT, /HT								DY100 (100mm,4in) /LT, /HT							
PROCESS CONNECTION	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 - AD2	AD3 - AD4
L	100 (3.94)								120 (4.72)							
B	40 (1.57)								50 (1.97)							
C	71 (2.80)								93.8 (3.69)							
D	127 (5.00)								157.2 (6.19)							
H	485 (19.09)								515 (20.28)							
H1	318 (12.52)								333 (13.11)							
E	57.4 (2.26)	61.2 (2.41)	65.1 (2.56)	(Note 1)	64.4 (2.54)	64.4 (2.54)	61.2 (2.41)	61.2 (2.41)	67 (2.64)	70.8 (2.79)	78.5 (3.09)	72.9 (2.87)	76.6 (3.02)	82.6 (3.25)	68.9 (2.71)	72.7 (2.86)
F	69.3 (2.73)	73.9 (2.91)	78.5 (3.09)	(Note 1)	77.7 (3.06)	77.7 (3.06)	73.9 (2.91)	73.9 (2.91)	80.8 (3.18)	85.5 (3.37)	94.7 (3.73)	88 (3.46)	92.5 (3.64)	99.7 (3.93)	83.1 (3.27)	87.8 (3.46)
G	17 (0.67)	21 (0.83)	21 (0.83)	(Note 1)	20 (0.79)	20 (0.79)	17 (0.67)	17 (0.67)	17 (0.67)	21 (0.83)	23 (0.91)	17 (0.67)	20 (0.79)	23 (0.91)	17 (0.67)	21 (0.83)
WEIGHT kg	9.8 (21.61lb)								13.2 (29.11lb)							

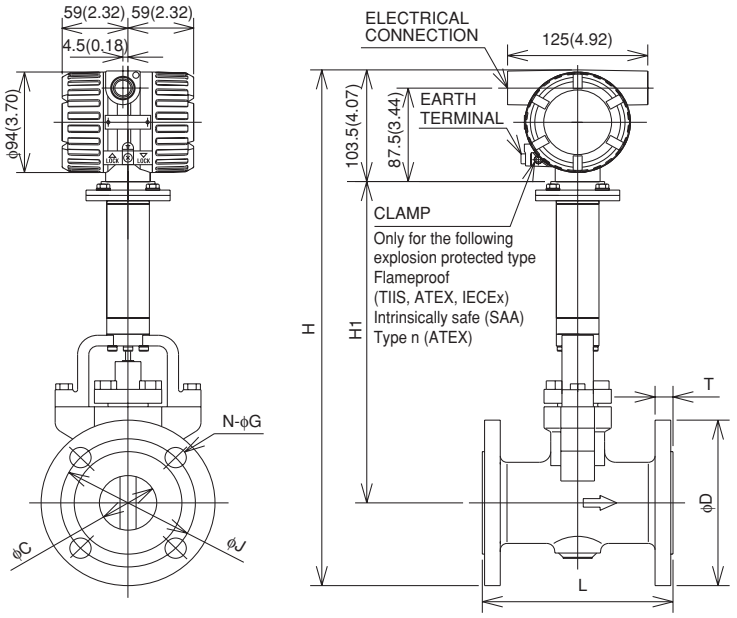
(Note 1) The hole is not provided.
(Note 2) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

■ **High Process Temperature Version (/HT): DY025-/HT up to DY100-/HT**

■ **Cryogenic Version (/LT): DY015-/LT up to DY100-/LT**

■ **Flange type**

Unit: mm
(approx. inch)



TYPE		Only for REMOTE																			
CODE		DY015 (15mm,½in) Only for /LT									DY025 (25mm,2in) /LT, /HT										
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		130 (5.12)						160 (6.30)	130 (5.12)	140 (5.51)	160 (6.30)	150 (5.91)						190 (7.48)	150 (5.91)	170 (6.69)	190 (7.48)
C		14.6 (0.57)										25.7 (1.01)									
D		95 (3.74)	95 (3.74)	115 (4.53)	88.9 (3.50)	95.3 (3.75)	95.3 (3.75)	120.7 (4.75)	95 (3.74)	95.3 (3.75)	120.7 (4.75)	125 (4.92)	125 (4.92)	130 (5.12)	108 (4.25)	124 (4.88)	124 (4.88)	149.4 (5.88)	115 (4.53)	124 (4.88)	149.4 (5.88)
H		421 (16.57)	421 (16.57)	431 (16.97)	418 (16.46)	421 (16.57)	421 (16.57)	434 (17.09)	421 (16.57)	421 (16.57)	434 (17.09)	438 (17.24)	438 (17.24)	441 (17.36)	430 (16.93)	438 (17.24)	438 (17.24)	450 (17.72)	433 (17.05)	438 (17.24)	450 (17.18)
H1		270 (10.63)										272 (10.71)									
T		12 (0.47)	14 (0.55)	20 (0.79	11.2 (0.44)	14.2 (0.56)	21 (0.83)	28.8 (1.13)	16 (0.63)	19.9 (0.78)	28.8 (1.13)	14 (0.55)	16 (0.63)	22 (0.87)	14.2 (0.56)	17.5 (0.69)	24 (0.94)	34.9 (1.37)	18 (0.71)	24 (0.94)	34.9 (1.37)
J		70 (2.76)	70 (2.76)	80 (3.15)	60.5 (2.38)	66.5 (2.62)	66.5 (2.62)	82.6 (2.25)	65 (2.56)	66.5 (2.62)	82.6 (2.25)	90 (3.54)	90 (3.54)	95 (3.74)	79.2 (3.12)	89 (3.50)	89 (3.50)	101.6 (4.00)	85 (3.35)	89 (3.50)	101.6 (4.00)
N		4 (0.16)										4 (0.16)									
G		15 (0.59)	15 (0.59)	19 (0.75)	15.7 (0.62)	15.7 (0.62)	15.7 (0.62)	22.4 (0.88)	14 (0.55)	15.7 (0.62)	22.4 (0.88)	19 (0.75)	19 (0.75)	19 (0.75)	15.7 (0.62)	19 (0.75)	19 (0.75)	25.4 (1.00)	14 (0.55)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	4.6	4.7	6.3	4.5	4.7	5.0	7.1	4.6	4.9	7.2	7.3	7.5	9.0	7.0	7.6	8.1	11.5	7.3	8.3	11.8
	lb	10.14	10.36	13.89	9.92	10.36	11.03	15.66	10.14	10.80	15.88	16.10	16.54	19.85	15.44	16.76	17.86	25.36	16.10	18.30	26.02

TYPE		Only for REMOTE																			
CODE		DY040 (40mm,1½in) /LT, /HT										DY050 (50mm,2in) /LT, /HT									
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD4	CA4	CA5
L		150 (5.91)						200 (7.87)	150 (5.91)	185 (7.28)	200 (7.87)	170 (6.69)						230 (9.06)	170 (6.69)	205 (8.07)	230 (9.06)
C		39.7 (1.56)										51.1 (2.01)									
D		140 (5.51)	140 (5.51)	160 (6.30)	127 (5.00)	155.4 (6.12)	155.4 (6.12)	177.8 (7.00)	150 (5.91)	155.4 (6.12)	177.8 (7.00)	155 (6.10)	155 (6.10)	165 (6.50)	152.4 (6.00)	165.1 (6.50)	165.1 (6.50)	215.9 (8.50)	165 (6.50)	165.1 (6.50)	215.9 (8.50)
H		453 (17.83)	453 (17.83)	463 (18.23)	446 (17.56)	460 (18.11)	460 (18.11)	472 (18.58)	458 (18.03)	460 (18.11)	472 (18.58)	482 (18.98)	482 (18.98)	487 (19.17)	481 (18.94)	487 (19.17)	487 (19.17)	513 (20.20)	487 (19.17)	487 (19.17)	513 (20.20)
H1		279 (10.98)										301 (11.85)									
T		16 (0.63)	18 (0.71)	26 (1.02)	17.5 (0.69)	20.6 (0.81)	28.8 (1.13)	38.2 (1.50)	18 (0.71)	28.8 (1.13)	38.2 (1.50)	16 (0.63)	18 (0.71)	26 (1.02)	19.1 (0.75)	22.4 (0.88)	31.8 (1.25)	44.5 (1.75)	20 (0.79)	33.3 (1.31)	46 (1.81)
J		105 (4.13)	105 (4.13)	120 (4.72)	98.6 (3.88)	114.3 (4.50)	114.3 (4.50)	124 (4.88)	110 (4.33)	114.3 (4.50)	124 (4.88)	120 (4.72)	120 (4.72)	130 (5.12)	120.7 (4.75)	127 (5.00)	127 (5.00)	165.1 (6.50)	125 (4.92)	127 (5.00)	165.1 (6.50)
N		4 (0.16)										4 (0.16)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)
G		19 (0.75)	19 (0.75)	23 (0.91)	15.7 (0.62)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	18 (0.71)	22.4 (0.88)	28.4 (1.12)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	19 (0.75)	25.4 (1.00)	18 (0.71)	19 (0.75)	25.4 (1.00)
WEIGHT	kg	8.6	8.8	12.3	8.5	9.7	11.7	16.6	9.2	12.1	16.7	11.5	12.0	14.7	12.1	13.6	15.2	26.9	11.7	16.2	27.3
	lb	18.96	19.40	27.12	18.74	21.39	25.80	36.60	20.29	26.68	36.82	25.36	26.46	32.42	26.68	29.99	33.52	59.32	25.80	35.72	60.20

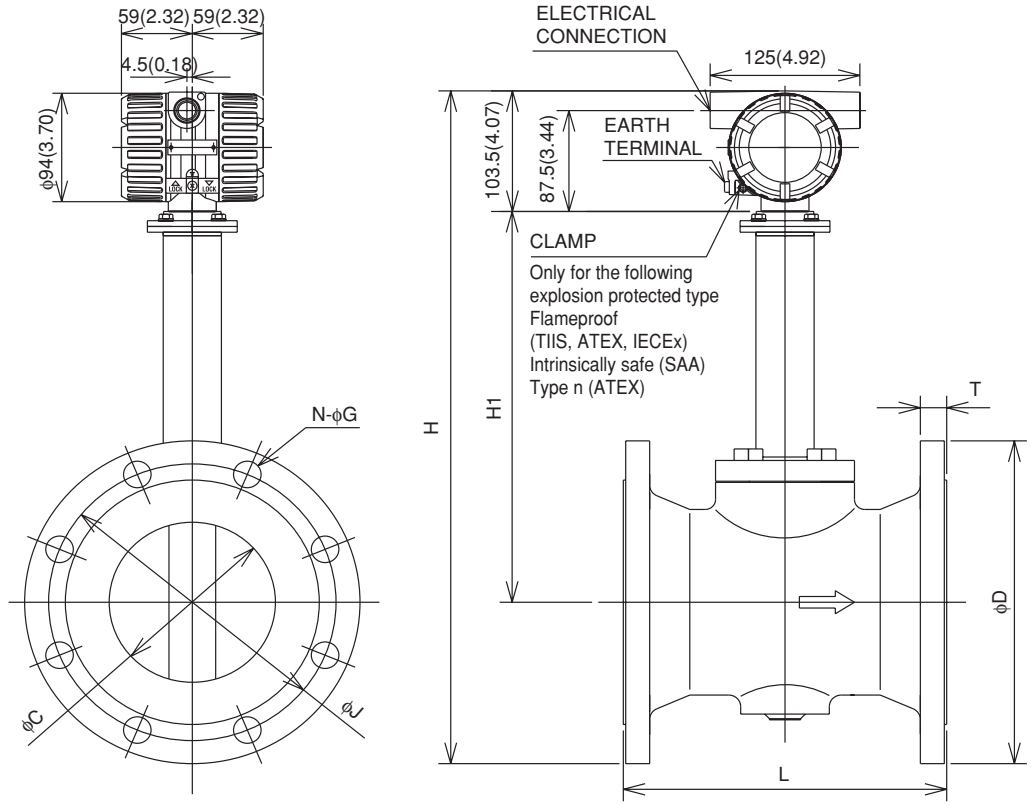
TYPE		Only for REMOTE																					
CODE		DY080 (80mm,3in) /LT, /HT										DY100 (100mm,4in) /LT, /HT											
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5
L		200 (7.87)						245 (9.65)	200 (7.87)		235 (9.25)	250 (9.84)	220 (8.66)					240 (9.45)	280 (11.02)	220 (8.66)		270 (10.63)	285 (11.22)
C		71 (2.80)											93.8 (3.69)										
D		185 (7.28)	200 (7.87)	210 (8.27)	190.5 (7.50)	209.6 (8.25)	209.6 (8.25)	241.3 (9.50)	200 (7.87)	200 (7.87)	209.6 (8.25)	241.3 (9.50)	210 (8.27)	225 (8.86)	250 (9.84)	228.6 (9.00)	254 (10.00)	273 (10.75)	292.1 (11.50)	220 (8.66)	235 (9.25)	273 (10.75)	292.1 (11.50)
H		514 (20.24)	522 (20.55)	527 (20.75)	517 (20.35)	527 (20.75)	527 (20.75)	542 (21.34)	522 (20.55)	522 (20.55)	527 (20.75)	542 (21.34)	542 (21.34)	549 (21.61)	562 (22.13)	552 (21.73)	564 (22.20)	573 (22.56)	583 (22.95)	547 (21.54)	554 (21.81)	573 (22.56)	583 (22.95)
H1		318 (12.52)											333 (13.11)										
T		18 (0.71)	22 (0.87)	32 (1.26)	23.9 (0.94)	28.4 (1.12)	38.2 (1.50)	44.5 (1.75)	20 (0.79)	24 (0.94)	39.7 (1.56)	46 (1.81)	18 (0.71)	24 (0.94)	36 (1.42)	23.9 (0.94)	31.8 (1.25)	44.5 (1.75)	50.9 (2.00)	20 (0.79)	24 (0.94)	46 (1.81)	52.4 (2.06)
J		150 (5.91)	160 (6.30)	170 (6.69)	152.4 (6.00)	168.2 (6.62)	168 (6.61)	190.5 (7.50)	160 (6.30)	160 (6.30)	170 (6.69)	180 (7.09)	175 (6.89)	185 (7.28)	205 (8.07)	190.5 (7.50)	200.2 (7.88)	216 (8.50)	235 (9.25)	180 (7.09)	190 (7.48)	216 (8.50)	235 (9.25)
N		8 (0.31)	8 (0.31)	8 (0.31)	4 (0.16)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)										
G		19 (0.75)	23 (0.91)	23 (0.91)	19 (0.75)	22.4 (0.88)	22.4 (0.88)	25.4 (1.00)	18 (0.71)	18 (0.71)	22.4 (0.88)	25.4 (1.00)	19 (0.75)	23 (0.91)	25 (0.98)	19 (0.75)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	18 (0.71)	22 (0.87)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	17.8	20.4	25.8	20.4	24.2	25.8	36.1	19.8	20.4	27.5	36.7	23.2	27.2	38.5	27.7	36.3	51.2	56.3	23.6	27.8	53.2	57.0
	lb	39.25	44.98	56.89	44.98	53.36	56.89	79.60	43.66	44.98	60.64	80.92	51.16	59.98	84.89	61.30	80.04	112.90	124.14	52.04	61.30	117.31	125.69

(Note 1) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

■ High Process Temperature Version (/HT): DY150-/HT up to DY300-/HT

■ Flange type

Unit: mm
(approx. inch)



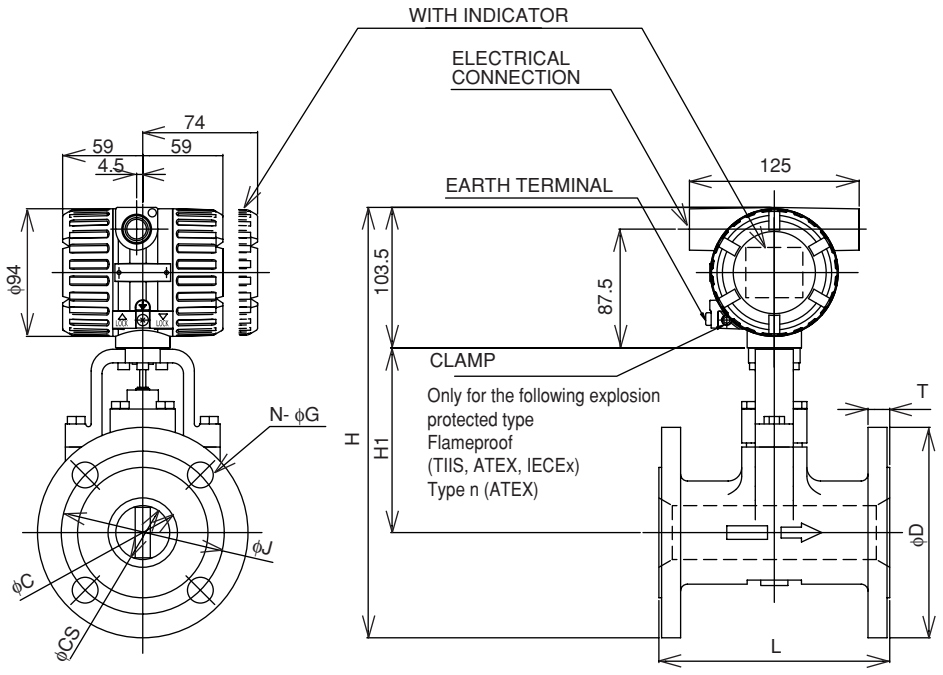
TYPE		Only for REMOTE																							
CODE		DY150 (150mm,6in) / HT											DY200 (200mm,8in) / HT											
PROCESS CONNECTION		BJ1	BJ2	BJ4	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1 - BD2	BD3 - BD4	CA4	CA5	BJ1	BJ2	BA1 BS1	BA2 BS2	BA4 BS4	BA5 BS5	BD1	BD2	BD3	BD4	CA4	CA5
L		270 (10.63)					310 (12.20)	336 (13.23)	270 (10.63)		325 (12.80)	340 (13.39)	310 (12.20)				370 (14.57)	386 (15.20)	310 (12.20)				375 (14.77)	390 (15.35)
C		138.8 (5.46)											185.6 (7.31)											
D		280 (11.02)	305 (12.01)	355 (13.98)	279.4 (11.00)	317.5 (12.50)	356 (14.02)	381 (15.00)	285 (11.22)	300 (11.81)	356 (14.02)	381 (15.00)	330 (12.99)	350 (13.78)	342.9 (13.50)	381 (15.00)	419.1 (16.50)	469.9 (18.50)	340 (13.39)	340 (13.39)	360 (14.17)	375 (14.76)	419.1 (16.50)	469.9 (18.50)
H	Shedder Bar Material: X	583 (22.95)	595 (23.43)	620 (24.41)	582 (22.91)	601 (23.66)	621 (24.45)	633 (24.92)	585 (23.03)	593 (23.35)	621 (24.45)	633 (24.92)	640 (25.20)	650 (25.59)	646 (25.43)	665 (26.18)	684 (26.93)	709 (27.91)	645 (25.39)	645 (25.39)	655 (25.79)	662 (26.06)	684 (26.93)	709 (27.91)
	Shedder Bar Material: B	590 (23.23)	602 (23.70)	627 (24.69)	589 (23.19)	608 (23.94)	628 (24.72)	640 (25.20)	592 (23.31)	600 (23.62)	628 (24.72)	640 (25.20)	647 (25.47)	657 (25.87)	653 (25.71)	672 (26.46)	691 (27.20)	716 (28.19)	652 (25.67)	652 (25.67)	662 (26.06)	669 (26.34)	691 (27.20)	716 (28.19)
H1	Shedder Bar Material: X	339 (13.35)											371 (14.61)											
	Shedder Bar Material: X	346 (13.62)											378 (14.88)											
T		22 (0.87)	28 (1.10)	44 (1.73)	25.4 (1.00)	36.6 (1.44)	54.4 (2.14)	62 (2.44)	22 (0.87)	28 (1.10)	55.7 (2.19)	63.6 (2.50)	22 (0.87)	30 (1.18)	28.4 (1.12)	41.1 (1.62)	62 (2.44)	69.9 (2.75)	24 (0.95)	24 (0.95)	30 (1.18)	34 (1.34)	63.6 (2.50)	71.4 (2.81)
J		240 (9.45)	260 (10.24)	295 (11.61)	241.3 (9.50)	269.7 (10.62)	292 (11.50)	317.5 (12.50)	240 (9.45)	250 (9.84)	292 (11.50)	317.5 (12.50)	290 (11.42)	305 (12.01)	298.5 (11.75)	330.2 (13.00)	349.3 (13.75)	393.7 (15.50)	295 (11.61)	295 (11.61)	310 (12.20)	320 (12.60)	349.3 (13.75)	393.7 (15.50)
N		8 (0.31)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)	12 (0.47)
G		23 (0.91)	25 (0.98)	33 (1.30)	22.4 (0.88)	22.4 (0.88)	28.4 (1.12)	31.8 (1.25)	22 (0.87)	26 (1.02)	28.4 (1.12)	31.8 (1.25)	23 (0.91)	25 (0.98)	22.4 (0.88)	25.4 (1.00)	31.8 (1.25)	38.1 (1.50)	22 (0.87)	22 (0.87)	26 (1.02)	30 (1.18)	31.8 (1.25)	38.1 (1.50)
WEIGHT	kg	33.4	43.4	76.4	36.4	54.4	84.4	106	33.4	42.9	90	107	45.4	52.4	55.4	80.4	136	182	46.3	46.3	53.6	55.9	139	183
	lb	73.65	95.70	168.46	80.26	119.95	186.10	233.73	73.65	94.59	198.45	235.94	100.11	115.54	122.16	177.28	299.88	401.31	102.09	102.09	118.19	123.26	306.50	403.52

(Note 1) The flow direction is opposite (right to left when facing onto indicator) in case of code / CRC.

TYPE		Only for REMOTE							
CODE		DY250 (250mm, 10in) / HT				DY300 (300mm, 12in) / HT			
PROCESS CONNECTION		BJ1	BJ2	BA1 BS1	BA2 BS2	BJ1	BJ2	BA1 BS1	BA2 BS2
L		370 (14.57)				400 (15.75)			
C		230.8 (9.09)				276.2 (10.87)			
D		400 (15.75)	430 (16.93)	406.4 (16.00)	444.5 (17.50)	445 (17.52)	480 (18.90)	482.6 (19.00)	520.7 (20.50)
H		720 (28.35)	735 (28.94)	723 (28.46)	742 (29.21)	772 (30.39)	790 (31.10)	791 (31.14)	810 (31.89)
H1		416 (16.38)				446 (17.56)			
T		24 (0.94)	34 (1.34)	30.2 (1.19)	47.8 (1.88)	24 (0.94)	36 (1.42)	31.8 (1.25)	50.8 (2.00)
J		355 (13.98)	380 (14.96)	362 (14.25)	387.4 (15.25)	400 (15.75)	430 (16.93)	431.8 (17.00)	450.9 (17.75)
N		12 (0.47)	12 (0.47)	12 (0.47)	16 (0.63)	16 (0.63)	16 (0.63)	12 (0.47)	16 (0.63)
G		25 (0.98)	27 (1.06)	25.4 (1.00)	28.5 (1.12)	25 (0.98)	27 (1.06)	25.4 (1.00)	31.8 (1.25)
WEIGHT	kg	78	100	90	125	100	128	140	178
	lb	171.99	220.50	198.45	275.63	220.50	282.24	308.70	392.49

■ **Reduced Bore Type (/R1):DY025-/R1 up to DY150-/R1**

■ **Flange type**



Model Code	DY025 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	150			
C	25.7			
CS	14.6			
D	125	125	108	124
H	293	293	284.5	292.5
H1	127			
T	14	16	14.2	17.5
J	90	90	79.2	89
N	4			
G	19	19	15.7	19
Weight kg	6.1	6.5	5.5	7.0

Model Code	DY040 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	150			
C	39.7			
CS	25.7			
D	140	140	127	155.4
H	302.5	302.5	296	310
H1	129			
T	16	18	17.5	20.6
J	105	105	98.6	114.3
N	4			
G	19	19	15.7	22.4
Weight kg	9.5	10.1	9.4	12.6

Model Code	DY050 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	170			
C	51.1			
CS	39.7			
D	155	155	152.4	165.1
H	317	317	315.5	322
H1	136			
T	16	18	19.1	22.4
J	120	120	120.7	127
N	4	8	4	8
G	19	19	19	19
Weight kg	10.5	11.1	11.4	13.6

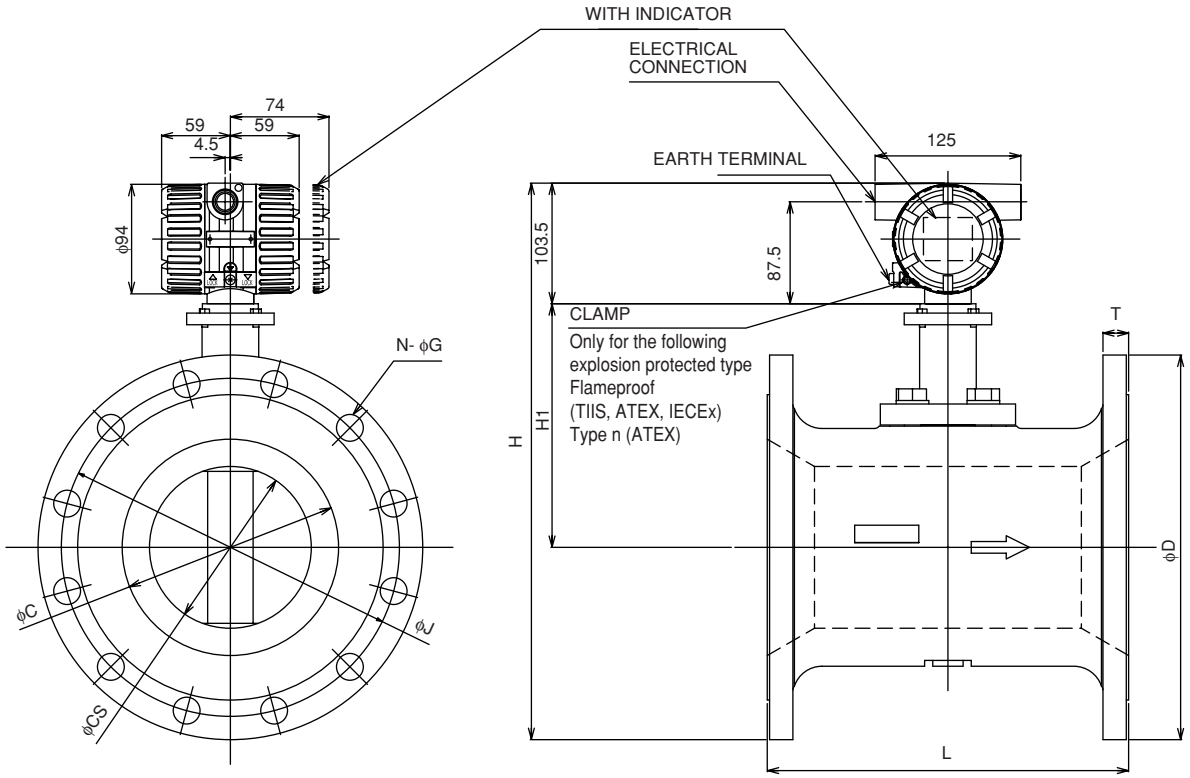
Model Code	DY080 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	200			
C	71			
CS	51.1			
D	185	200	190.5	209.6
H	354	361.5	357	366.5
H1	158			
T	18	22	23.9	28.4
J	150	160	152.4	168.2
N	8	8	4	8
G	19	23	19	22.4
Weight kg	18.6	21.7	21.9	26.9

Model Code	DY100 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	220			
C	93.8			
CS	71			
D	210	225	228.6	254
H	383.5	391	393	405.5
H1	175			
T	18	24	23.9	31.8
J	175	185	190.5	200.2
N	8			
G	19	23	19	22.4
Weight kg	25	30	30.6	41.0

Model Code	DY150 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	270			
C	138.8			
CS	93.8			
D	280	305	279.4	317.5
H	433.5	446	433	452
H1	190			
T	22	28	25.4	36.6
J	240	260	241.3	269.7
N	8	12	8	12
G	23	25	22.4	22.4
Weight kg	45.9	56.3	49.4	71.7

■ **Reduced Bore Type (/R1):DY200-/R1**

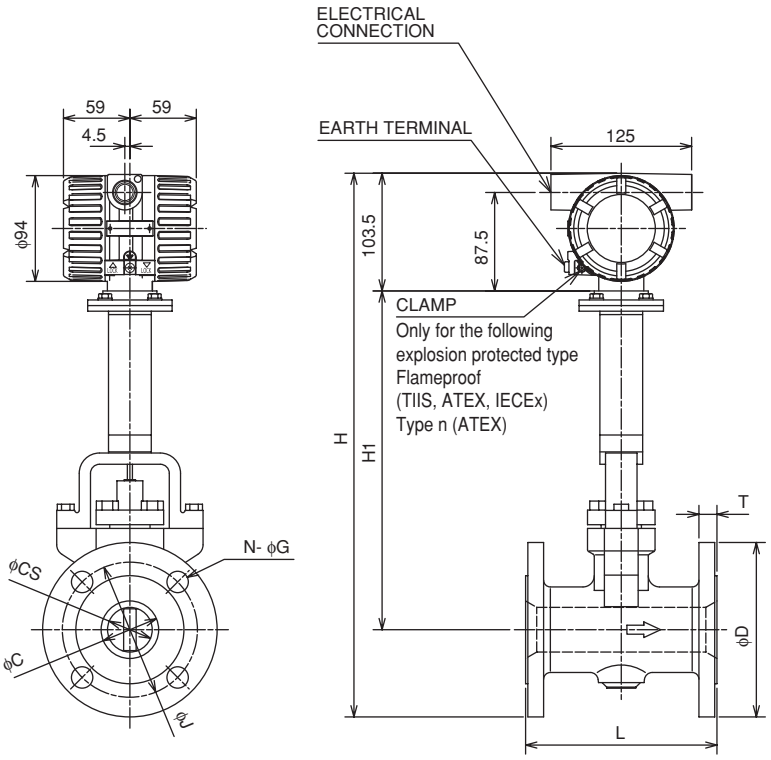
■ **Flange type**



Model Code		DY200 /R1			
Process Connection		BJ1	BJ2	BA1 BS1	BA2 BS2
L		310 (12.20)			
C		185.6 (7.31)			
CS		138.8 (8.46)			
D		330 (12.99)	350 (13.78)	342.9 (13.50)	381 (15.00)
H	Shedder Bar Material: X	477.5 (18.80)	487.5 (19.19)	484 (19.06)	503 (19.80)
	Shedder Bar Material: B	484.5 (19.07)	494.5 (19.47)	491 (19.33)	510 (20.08)
H1	Shedder Bar Material: X	209 (8.23)			
	Shedder Bar Material: B	216 (8.50)			
T		22 (0.87)	30 (1.18)	28.4 (1.12)	41.1 (1.62)
J		290 (11.42)	305 (12.01)	298.5 (11.75)	330.2 (13.00)
N		12 (0.47)	12 (0.47)	8 (0.31)	12 (0.47)
G		23 (0.91)	25 (0.98)	22.4 (0.88)	25.4 (1.00)
Weight kg		58.7	74.1	70.7	102.9

■ **High Process Temperature Version Reduced Bore Type (/R1/HT): DY040-/HT/R1 up to DY150-/R1/HT**

■ **Flange type**



Model Code	DY040 /R1/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	150			
C	39.7			
CS	25.7			
D	140	140	127	155.4
H	445.5	445.5	439	453
H1	272			
T	16	18	17.5	20.6
J	105	105	98.6	114.3
N	4			
G	19	19	15.7	22.4
Weight kg	10	10.5	9.8	13.0

Model Code	DY050 /R1/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	170			
C	51.1			
CS	39.7			
D	155	155	152.4	165.1
H	460	460	458.5	465
H1	279			
T	16	18	19.1	22.4
J	120	120	120.7	127
N	4	8	4	8
G	19	19	19	19
Weight kg	10.9	11.5	11.8	14.0

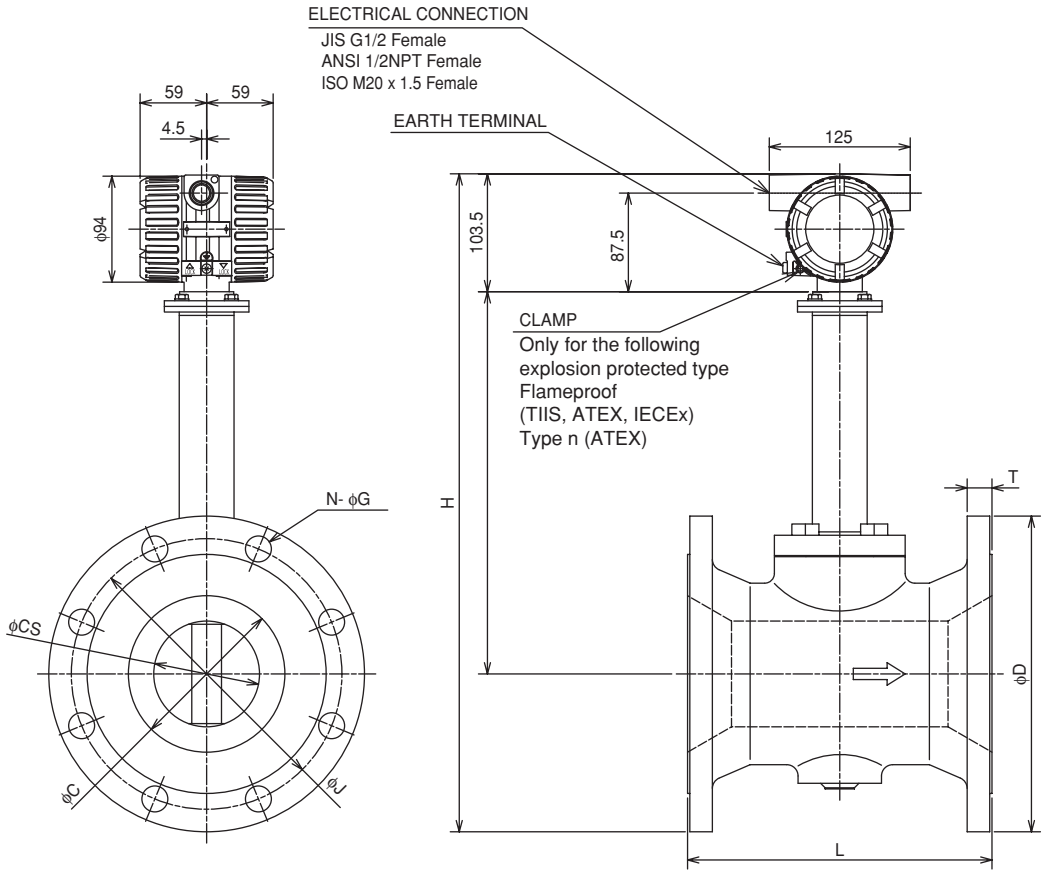
Model Code	DY080 /R1/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	200			
C	71			
CS	51.1			
D	185	200	190.5	209.6
H	497	504.5	500	509.5
H1	301			
T	18	22	23.9	28.4
J	150	160	152.4	168.2
N	8	8	4	8
G	19	23	19	22.4
Weight kg	19	22.1	22.3	27.3

Model Code	DY100 /R1/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	220			
C	93.8			
CS	71			
D	210	225	228.6	254
H	526.5	534	536	548.5
H1	318			
T	18	24	23.9	31.8
J	175	185	190.5	200.2
N	8			
G	19	23	19	22.4
Weight kg	25.4	30.4	31.0	41.4

Model Code	DY150 /R1/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	270			
C	138.8			
CS	93.8			
D	280	305	279.4	317.5
H	576.5	589	576	595.5
H1	333			
T	22	28	25.4	36.6
J	240	260	241.3	269.7
N	8	12	8	12
G	23	25	22.4	22.4
Weight kg	45.9	56.3	49.4	71.7

■ **High Process Temperature Version Reduced Bore Type (/R1/HT): DY200-/R1/HT**

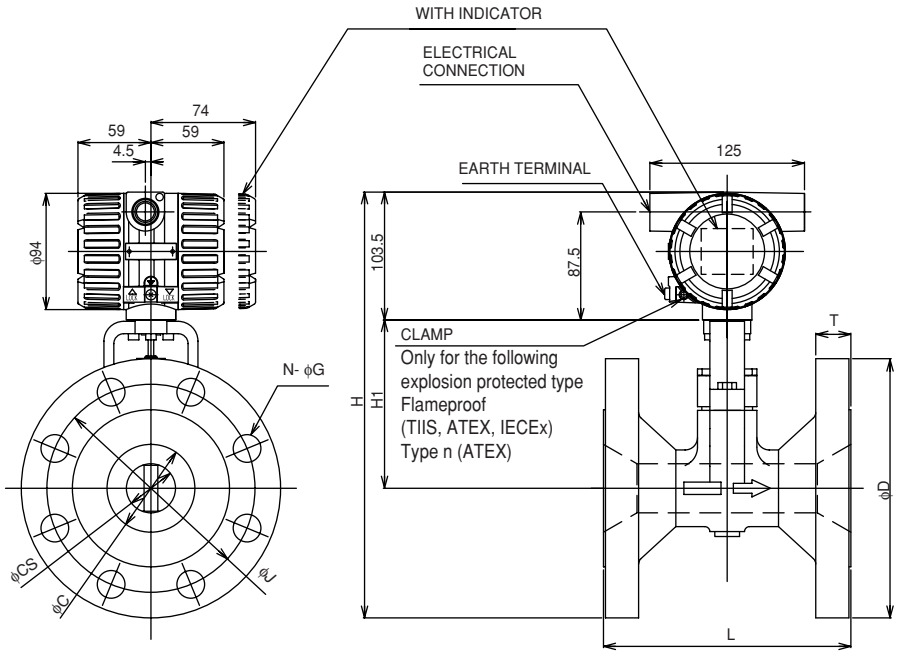
■ **Flange type**



Model Code		DY200 /R1/HT			
Process Connection		BJ1	BJ2	BA1 BS1	BA2 BS2
L		310			
C		185.6			
CS		138.8			
D		330	350	342.9	381
H	Shedder Bar Material: X	607.5 (23.92)	617.5 (24.31)	614 (24.17)	633 (24.92)
	Shedder Bar Material: B	614.5 (24.19)	624.5 (24.59)	621 (24.45)	640 (25.20)
H1	Shedder Bar Material: X	339 (13.35)			
	Shedder Bar Material: B	346 (13.62)			
T		22	30	28.4	41.1
J		290	305	298.5	330.2
N		12	12	8	12
G		23	25	22.4	25.4
Weight kg		58.7	74.1	70.7	102.9

■ **Reduced Bore Type (/R2): DY040-/R2 up to DY200-/R2**

■ **Flange type**



Model Code	DY040 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	150			
C	39.7			
CS	14.6			
D	140	140	127	155.4
H	300.5	300.5	294.0	308.2
H1	127			
T	16	18	17.5	20.6
J	105	105	98.6	114.3
N	4			
G	19	19	15.7	22.4
Weight kg	7.7	7.9	7.6	8.8

Model Code	DY050 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	170			
C	51.1			
CS	25.7			
D	155	155	152.4	165.1
H	310	310	308.7	315.1
H1	129			
T	16	18	19.1	22.4
J	120	120	120.7	127
N	4	8	4	8
G	19			
Weight kg	10	10.5	10.6	12.1

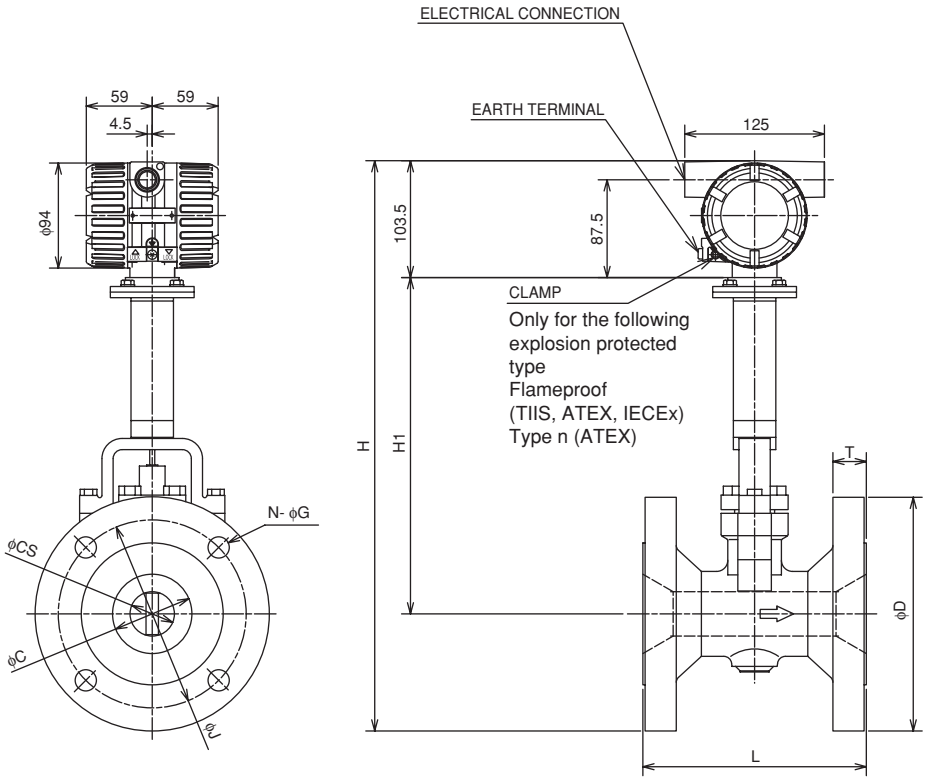
Model Code	DY080 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	200			
C	71			
CS	39.7			
D	185	200	190.5	209.6
H	332	339.5	334.8	344.3
H1	136			
T	18	22	23.9	28.4
J	150	160	152.4	168.2
N	8	8	4	8
G	19	23	19	22.4
Weight kg	13.6	16.2	16.2	20

Model Code	DY100 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	220			
C	93.8			
CS	51.1			
D	210	225	228.6	254
H	366.5	374	375.8	388.5
H1	158			
T	18	24	23.9	31.8
J	175	185	190.5	200.2
N	8			
G	19	23	19	22.4
Weight kg	20.9	24.9	25.5	34

Model Code	DY150 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	270			
C	138.8			
CS	71			
D	280	305	279.4	317.5
H	418.5	431	418.2	437.3
H1	175			
T	22	28	25.4	36.6
J	240	260	241.3	269.7
N	8	12	8	12
G	23	25	22.4	22.4
Weight kg	40.3	50.3	43.3	61.3

Model Code	DY200 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	310			
C	185.6			
CS	93.8			
D	330	350	342.9	381
H	458.5	468.5	465.0	484
H1	190			
T	22	30	28.4	41.1
J	290	305	298.5	330.2
N	12	12	8	12
G	23	25	22.4	25.4
Weight kg	61.9	68.9	71.9	96.9

■ High Process Temperature Version Reduced Bore Type (/R2/HT): DY050-/R2/HT up to DY200-/R2/HT



Model Code	DY050 /R2/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	170			
C	51.1			
CS	25.7			
D	155	155	152.4	165.1
H	453	453	451.7	458.1
H1	272			
T	16	18	19.1	22.4
J	120	120	120.7	127
N	4	8	4	8
G	19			
Weight kg	10.4	10.9	11	12.5

Model Code	DY080 /R2/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	200			
C	71			
CS	39.7			
D	185	200	190.5	209.6
H	475	482.5	477.8	487.3
H1	279			
T	18	22	23.9	28.4
J	150	160	152.4	168.2
N	8	8	4	8
G	19	23	19	22.4
Weight kg	14	16.6	16.6	20.4

Model Code	DY100 /R2/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	220			
C	93.8			
CS	51.1			
D	210	225	228.6	254
H	509.5	517	518.8	531.5
H1	301			
T	18	24	23.9	31.8
J	175	185	190.5	200.2
N	8			
G	19	23	19	22.4
Weight kg	21.3	25.3	25.9	34.4

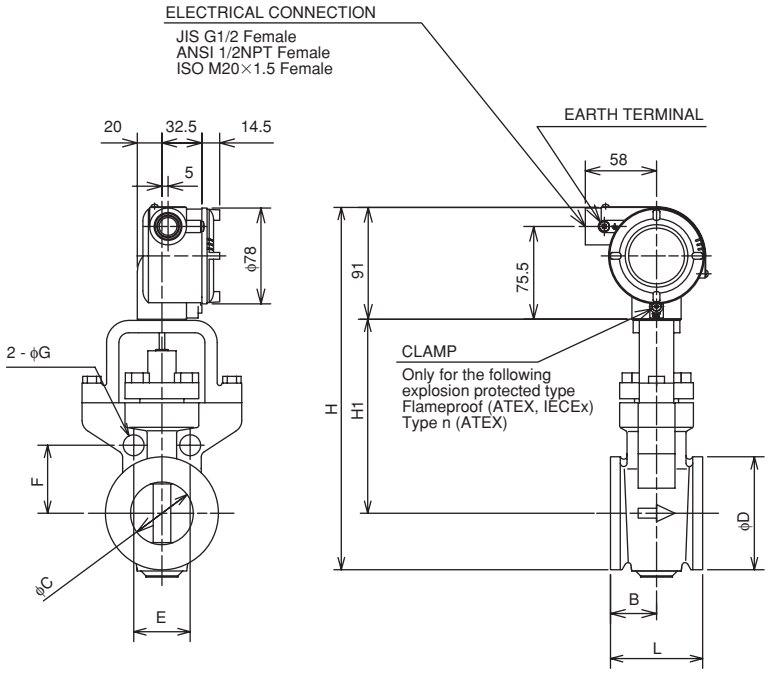
Model Code	DY150 /R2/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	270			
C	138.8			
CS	71			
D	280	305	279.4	317.5
H	561.5	574	561.2	580.3
H1	318			
T	22	28	25.4	36.6
J	240	260	241.3	269.7
N	8	12	8	12
G	23	25	22.4	22.4
Weight kg	40.3	50.3	43.3	61.3

Model Code	DY200 /R2/HT			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	310			
C	185.6			
CS	93.8			
D	330	350	342.9	381
H	601.5	611.5	608	627
H1	333			
T	22	30	28.4	41.1
J	290	305	298.5	330.2
N	12	12	8	12
G	23	25	22.4	25.4
Weight kg	61.9	68.9	71.9	96.9

■ **Stainless Steel Housing: DY015-/E1 up to DY100-/E1**

■ **Wafer Type**

Unit: mm
(approx. inch)



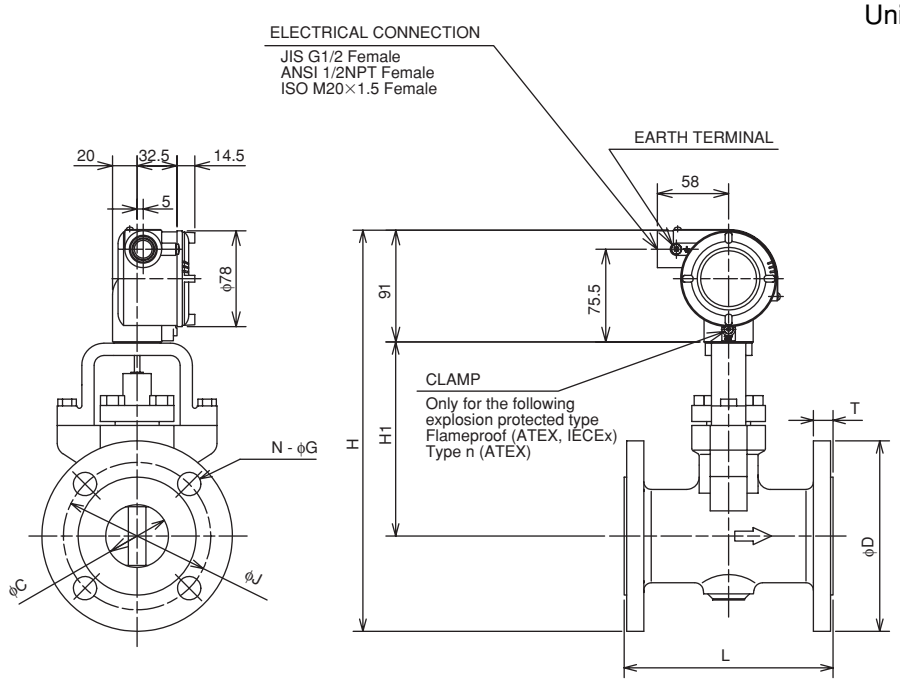
Model Code	DY015 (15mm, 1/2in) /E1							DY025 (25mm, 1in) /E1							DY040 (40mm, 1 1/2in) /E1						
Process Connection	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 to AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 to AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 to AD4
L	70							70							70						
B	35							35							35						
C	14.6							25.7							39.7						
D	35.1							50.8							73						
H	235.5							245.4							263.5						
H1	127							129							136						
E	49.5	49.5	56.6	42.7	47.1	47.1	46	63.6	63.6	67.2	56	62.9	62.9	60.1	74.2	74.2	84.9	69.7	80.8	80.8	77.8
F	24.7	24.7	28.3	21.4	23.5	23.5	23	31.8	31.8	33.6	28	31.4	31.4	30.1	37.1	37.1	42.4	34.8	40.4	40.4	38.9
G	13	13	17	14	14	14	13	17	17	17	14	17	17	13	17	17	21	14	20	20	17
Weight kg	2.9							3.8							4.4						

Model Code	DY050 (50mm, 2in) /E1							DY080 (80mm, 3in) /E1								DY100 (100mm, 4in) /E1							
Process Connection	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 to AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 to AD2	AD3 to AD4	AJ1	AJ2	AJ4	AA1	AA2	AA4	AD1 to AD2	AD3 to AD4
L	75							100								120							
B	37.5							40								50							
C	51.1							71								93.8							
D	92							127								157.2							
H	295							329.5								359.6							
H1	158							175								190							
E		45.9	49.8		48.6	48.6		57.4	61.2	65.1		64.4	64.4	61.2	61.2	67	70.8	78.5	72.9	76.6	82.6	68.9	72.7
F		55.4	60.1		58.7	58.7		69.3	73.9	78.5		77.7	77.7	73.9	73.9	80.8	85.5	94.7	88	92.5	99.7	83.1	87.8
G		17	17		17	17		17	21	21		20	20	17	17	17	21	23	17	20	23	17	21
Weight kg	6.1							9.5								12.9							

■ **Stainless Steel Housing: DY015-/E1 up to DY100-/E1**

■ **Flange type**

Unit: mm



Model Code	DY015 (15mm, 1/2in) /E1									
Process Connection	BJ1	BJ2	BJ4	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1 to BD4	CA4	CA5
L	130						160	130	140	160
C	14.6									
D	95	95	115	88.9	95.3	95.3	120.7	95	95.3	120.7
H	265.5	265.5	275.5	262.5	265.5	265.5	278.5	265.5	265.5	278.5
H1	127									
T	12	14	20	11.2	14.2	21	28.8	16	19.9	28.8
J	70	70	80	60.5	66.5	66.5	82.6	65	66.5	82.6
N	4									
G	15	15	19	15.7	15.7	15.7	22.4	14	15.7	22.4
Weight kg	4.3	4.4	6	4.2	4.4	4.7	6.8	4.3	4.6	6.9

Model Code	DY025 (25mm, 1in) /E1									
Process Connection	BJ1	BJ2	BJ4	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1 to BD4	CA4	CA5
L	150						190	150	170	190
C	25.7									
D	125	125	130	108	124	124	149.4	115	124	149.4
H	282.5	282.5	285	274	282	282	294.7	277.5	282	294.7
H1	129									
T	14	16	22	14.2	17.5	24	34.9	18	24	34.9
J	90	90	95	79.2	89	89	101.6	85	89	101.6
N	4									
G	19	19	19	15.7	19	19	25.4	14	19	25.4
Weight kg	7	7.2	8.7	6.7	7.3	7.8	11.2	7	8	11.5

Model Code	DY040 (40mm, 1 1/2in) /E1									
Process Connection	BJ1	BJ2	BJ4	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1 to BD4	CA4	CA5
L	150						200	150	185	200
C	39.7									
D	140	140	160	127	155.4	155.4	177.8	150	155.4	177.8
H	297	297	307	290.5	304.7	304.7	315.9	302	304.7	315.9
H1	136									
T	16	18	26	17.5	20.6	28.8	38.2	18	28.8	38.2
J	105	105	120	98.6	114.3	114.3	124	110	114.3	124
N	4									
G	19	19	23	15.7	22.4	22.4	28.4	18	22.4	28.4
Weight kg	8.3	8.5	12	8.2	9.4	11.4	16.3	8.9	11.8	16.4

Model Code	DY050 (50mm, 2in) /E1									
Process Connection	BJ1	BJ2	BJ4	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1 to BD4	CA4	CA5
L	170						230	170	205	230
C	51.1									
D	155	155	165	152.4	165.1	165.1	215.9	165	165.1	215.9
H	326.5	326.5	331.5	325.2	331.5	331.5	357	331.5	331.5	357
H1	158									
T	16	18	26	19.1	22.4	31.8	44.5	20	33.3	46
J	120	120	130	120.7	127	127	165.1	125	127	165.1
N	4	8	8	4	8	8	8	4	8	8
G	19	19	19	19	19	19	25.4	18	19	25.4
Weight kg	11.2	11.7	14.4	11.8	13.3	14.9	26.6	11.4	15.9	27

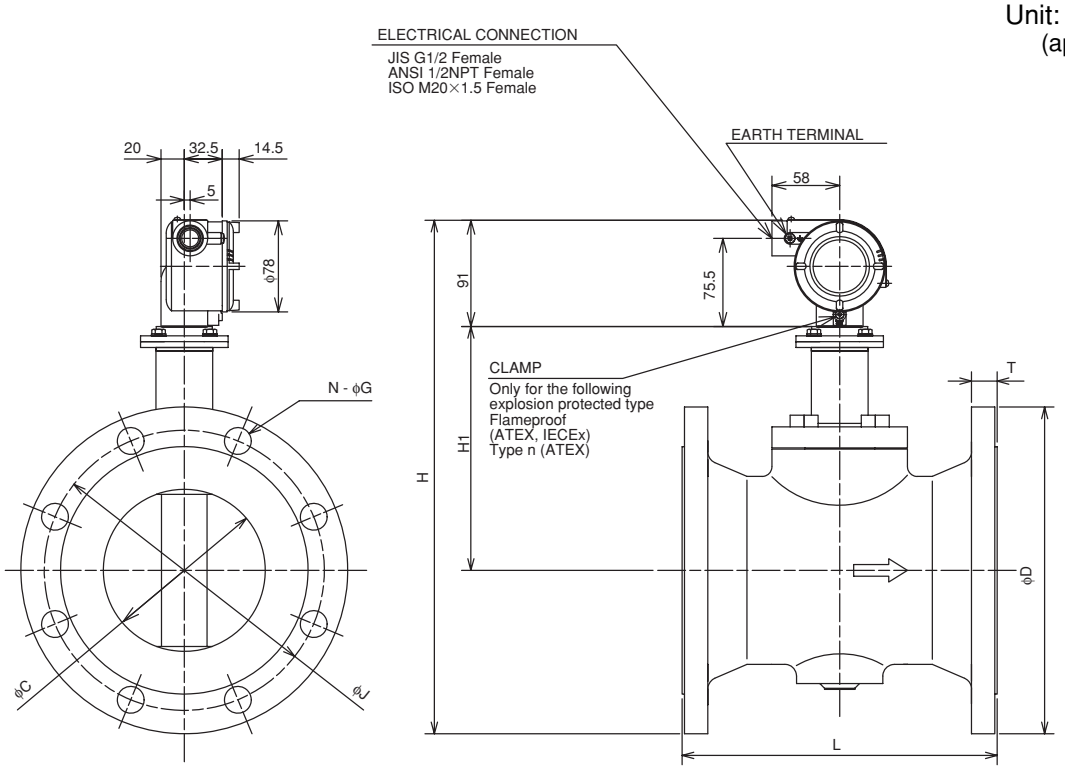
Model Code	DY080 (80mm, 8in) /E1										
Process Connection	BJ1	BJ2	BJ4	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1 to BD2	BD3 to BD4	CA4	CA5
L	200						245	200		235	250
C	71										
D	185	200	210	190.5	209.6	209.6	241.3	200	200	209.6	241.3
H	358.5	366	371	361.5	370.8	370.8	386.5	366	366	370.8	386.5
H1	175										
T	18	22	32	23.9	28.4	38.2	44.5	20	24	39.7	46
J	150	160	170	152.4	168.2	168	190.5	160	160	168	190.5
N	8	8	8	4	8	8	8	8	8	8	8
G	19	23	23	19	22.4	22.4	25.4	18	18	22.4	25.4
Weight kg	17.5	20.1	25.5	20.1	23.9	25.5	35.8	19.5	20.1	27.2	36.4

Model Code	DY100 (100mm, 4in) /E1										
Process Connection	BJ1	BJ2	BJ4	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1 to BD2	BD3 to BD4	CA4	CA5
L	220					240	280	220		270	285
C	93.8										
D	210	225	250	228.6	254	273	292.1	220	235	273	292.1
H	386	393.5	406	395.3	408	417.5	427	391	398.5	417.5	427
H1	190										
T	18	24	36	23.9	31.8	44.5	50.9	20	24	46	52.4
J	175	185	205	190.5	200.2	216	235	180	190	216	235
N	8										
G	19	23	25	19	22.4	25.4	31.8	18	22	25.4	31.8
Weight kg	22.9	26.9	38.2	27.5	36	50.9	56	23.3	27.5	52.9	56.7

■ **Stainless Steel Housing: DY150-/E1 up to DY300-/E1**

■ **Flange type**

Unit: mm
(approx. inch)



Model Code		DY150 (150mm, 6in) /E1										
Process Connection		BJ1	BJ2	BJ4	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1 to BD2	BD3 to BD4	CA4	CA5
L		270					310	336	270		325	340
C		138.8										
D		280	305	355	279.4	317.5	356	381	285	300	356	381
H	Shedder Bar Material: X	440 (17.32)	452.4 (17.81)	477.5 (18.80)	439.7 (17.31)	458.5 (18.05)	478 (18.82)	490.5 (19.31)	442.5 (17.42)	450 (17.72)	478 (18.82)	490.5 (19.31)
	Shedder Bar Material: B	447 (17.60)	459.4 (18.09)	484.5 (19.07)	446.7 (17.59)	465.5 (18.33)	485 (19.09)	497.5 (19.59)	449.5 (17.70)	457 (17.99)	485 (19.09)	497.5 (19.59)
H1	Shedder Bar Material: X	209 (8.23)										
	Shedder Bar Material: B	216 (8.50)										
T		22	28	44	25.4	36.6	54.4	62	22	28	55.7	63.6
J		240	260	295	241.3	269.7	292	317.5	240	250	292	317.5
N		8	12	12	8	12	12	12	8	8	12	12
G		23	25	33	22.4	22.4	28.4	31.8	22	26	28.4	31.8
Weight kg		33.5	43.5	76.5	36.5	54.5	84.5	106.1	33.5	43	90.1	107.1

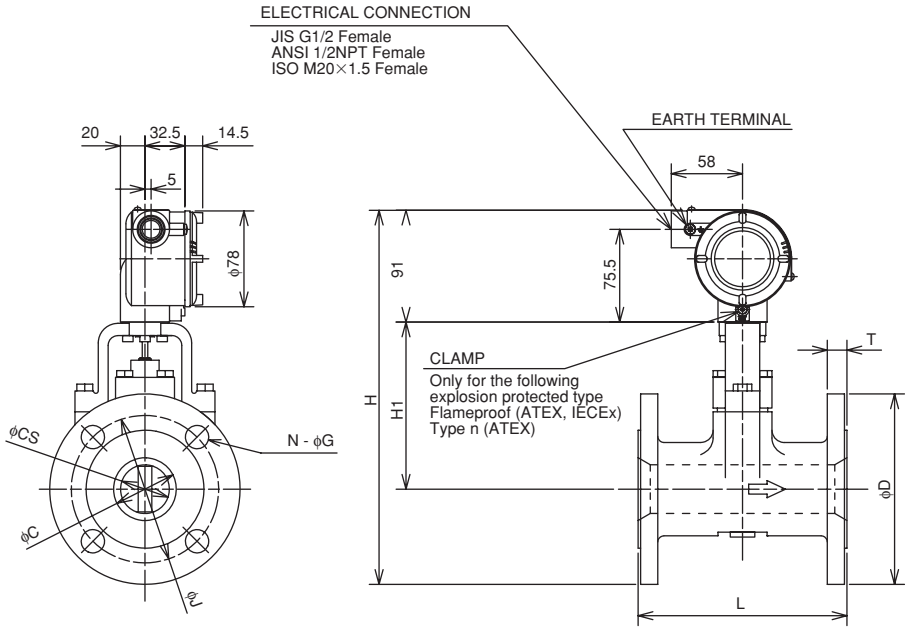
Model Code		DY200 (200mm, 8in) /E1										
Process Connection		BJ1	BJ2	BS1 BA1	BS2 BA2	BS4 BA4	BS5 BA5	BD1	BD2	BD3	BD4	CA4	CA5
L		310				370	386	310				375	390
C		185.6											
D		330	350	342.9	381	419.1	469.9	340	340	360	375	419.1	469.9
H	Shedder Bar Material: X	497 (19.57)	507 (19.96)	503.5 (19.82)	522.5 (20.57)	541.5 (21.32)	567 (22.32)	502 (19.76)	502 (19.76)	512 (20.16)	519.5 (20.45)	541.5 (21.32)	567 (22.32)
	Shedder Bar Material: B	504 (19.84)	514 (20.24)	510.5 (20.10)	529.5 (20.85)	548.5 (21.59)	574 (22.60)	509 (20.04)	509 (20.04)	519 (20.43)	526.5 (20.73)	548.5 (21.59)	574 (22.60)
H1	Shedder Bar Material: X	241 (9.49)											
	Shedder Bar Material: B	248 (9.76)											
T		22	30	28.4	41.1	62	69.9	24	24	30	34	63.6	71.4
J		290	305	298.5	330.2	349.3	393.7	295	295	310	320	349.3	393.7
N		12	12	8	12	12	12	8	12	12	12	12	12
G		23	25	22.4	25.4	31.8	38.1	22	22	26	30	31.8	38.1
Weight kg		45.5	52.5	55.5	80.5	136.1	182.1	46.4	46.4	53.7	56	139.1	183.1

Model Code	DY250 (250mm, 10in) /E1				DY300 (300mm, 12in) /E1			
Process Connection	BJ1	BJ2	BS1 BA1	BS2 BA2	BJ1	BJ2	BS1 BA1	BS2 BA2
L	370				400			
C	230.8				276.2			
D	400	430	406.4	444.5	445	480	482.6	520.7
H	568	583	571.2	590.5	620.5	638	639.3	658.5
H1	277				307			
T	24	34	30.2	47.8	24	36	31.8	50.8
J	355	380	362	387.4	400	430	431.8	450.9
N	12	12	12	16	16	16	12	16
G	25	27	25.4	28.5	25	27	25.4	31.8
Weight kg	78.1	100.1	90.1	125.1	100.1	128.1	140.1	178.1

■ **Stainless Steel Housing Reduced Bore Type (/E1/R1): DY025-/E1/R1 up to DY150-/E1/R1**

■ **Flange type**

Unit: mm



Model Code	DY025 /E1 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	150			
C	25.7			
CS	14.6			
D	125	125	108	124
H	280.5	280.5	272	280
H1	127			
T	14	16	14.2	17.5
J	90	90	79.2	89
N	4			
G	19	19	15.7	19
Weight kg	6.2	6.6	5.6	7.1

Model Code	DY040 /E1 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	150			
C	39.7			
CS	25.7			
D	140	140	127	155.4
H	290	290	283.5	297.7
H1	129			
T	16	18	17.5	20.6
J	105	105	98.6	114.3
N	4			
G	19	19	15.7	22.4
Weight kg	9.7	10.2	9.5	12.7

Model Code	DY050 /E1 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	170			
C	51.1			
CS	39.7			
D	155	155	152.4	165.1
H	304.5	304.5	303.2	309.5
H1	136			
T	16	18	19.1	22.4
J	120	120	120.7	127
N	4	8	4	8
G	19	19	19	19
Weight kg	10.6	11.2	11.5	13.7

Model Code	DY080 /E1 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	200			
C	71			
CS	51.1			
D	185	200	190.5	209.6
H	341.5	349	344.5	353.8
H1	158			
T	18	22	23.9	28.4
J	150	160	152.4	168.2
N	8	8	4	8
G	19	23	19	22.4
Weight kg	18.7	21.8	22	27

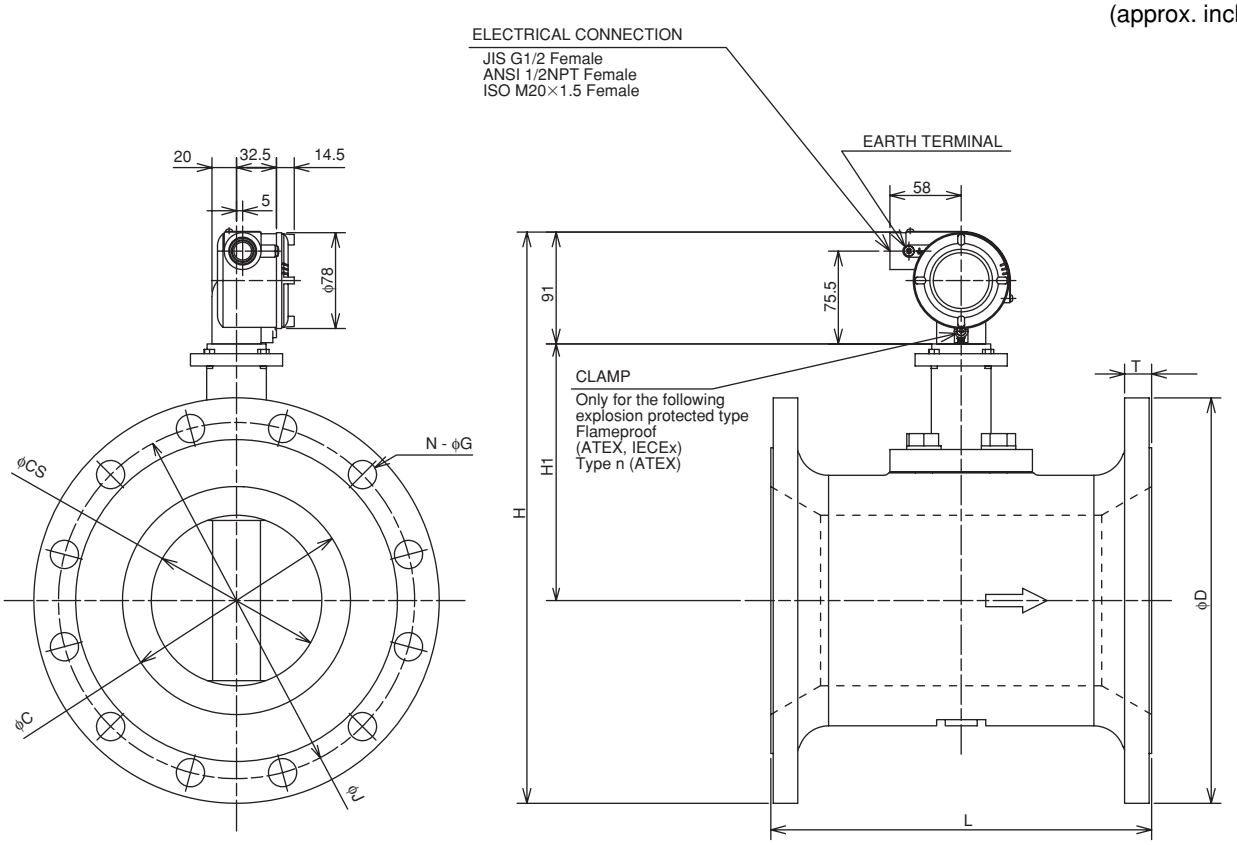
Model Code	DY100 /E1 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	220			
C	93.8			
CS	71			
D	210	225	228.6	254
H	371	378.5	380.3	393
H1	175			
T	18	24	23.9	31.8
J	175	185	190.5	200.2
N	8			
G	19	23	19	22.4
Weight kg	25.1	30.1	30.7	41.4

Model Code	DY150 /E1 /R1			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	270			
C	138.8			
CS	93.8			
D	280	305	279.4	317.5
H	421	433.5	420.7	439.5
H1	190			
T	22	28	25.4	36.6
J	240	260	241.3	269.7
N	8	12	8	12
G	23	25	22.4	22.4
Weight kg	46	56.4	49.5	71.8

■ **Stainless Steel Housing Reduced Bore Type (/E1/R1): DY200-/E1/R1**

■ **Flange type**

Unit: mm
(approx. inch)

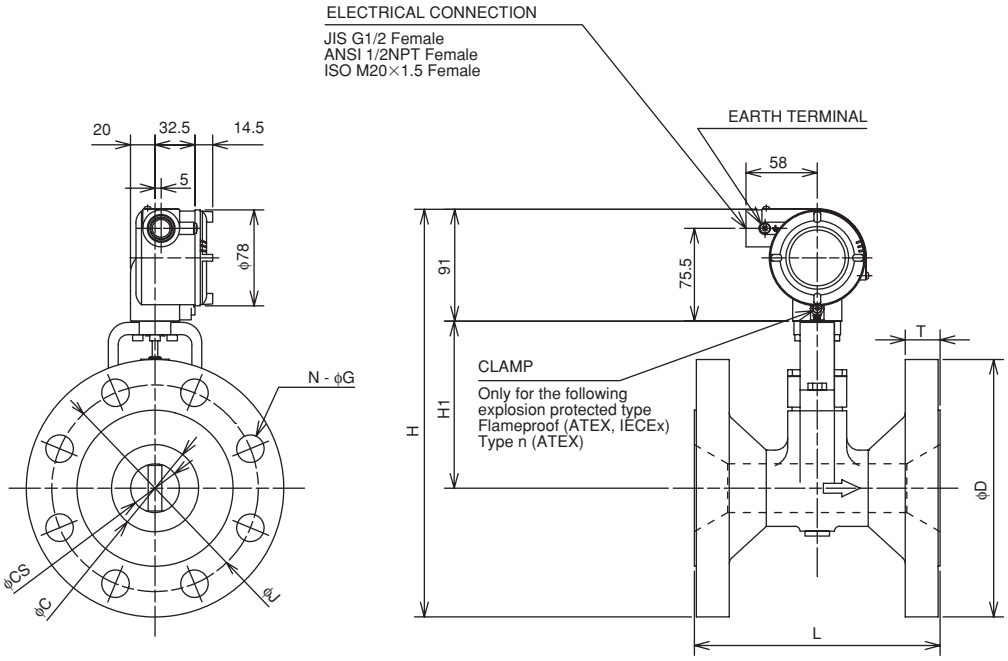


Model Code		DY200 /E1 /R1			
Process Connection		BJ1	BJ2	BA1 BS1	BA2 BS2
L		310			
C		185.6			
CS		138.8			
D		330	350	342.9	381
H	Shedder Bar Material: X	465 (18.31)	475 (18.70)	471.5 (18.56)	490.5 (19.31)
	Shedder Bar Material: B	472 (18.58)	482 (18.98)	478.5 (18.84)	497.5 (19.59)
H1	Shedder Bar Material: X	209 (8.23)			
	Shedder Bar Material: B	216 (8.50)			
T		22	30	28.4	41.1
J		290	305	298.5	330.2
N		12	12	8	12
G		23	25	22.4	25.4
Weight kg		58.8	74.2	70.8	103

■ **Stainless Steel Housing Reduced Bore Type (/E1/R2): DY040-/E1/R1 up to DY200-/E1/R2**

■ **Flange type**

Unit: mm



Model Code	DY040 /E1 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	150			
C	39.7			
CS	14.6			
D	140	140	127	155.4
H	288	288	281.5	295.7
H1	127			
T	16	18	17.5	20.6
J	105	105	98.6	114.3
N	4			
G	19	19	15.7	22.4
Weight kg	7.8	8	7.7	8.9

Model Code	DY050 /E1 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	170			
C	51.1			
CS	25.7			
D	155	155	152.4	165.1
H	297.5	297.5	296.2	302.5
H1	129			
T	16	18	19.1	22.4
J	120	120	120.7	127
N	4	8	4	8
G	19			
Weight kg	10.1	10.6	10.7	12.2

Model Code	DY080 /E1 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	200			
C	71			
CS	39.7			
D	185	200	190.5	209.6
H	319.5	327	322.5	331.8
H1	136			
T	18	22	23.9	28.4
J	150	160	152.4	168.2
N	8	8	4	8
G	19	23	19	22.4
Weight kg	13.7	16.3	16.3	20.1

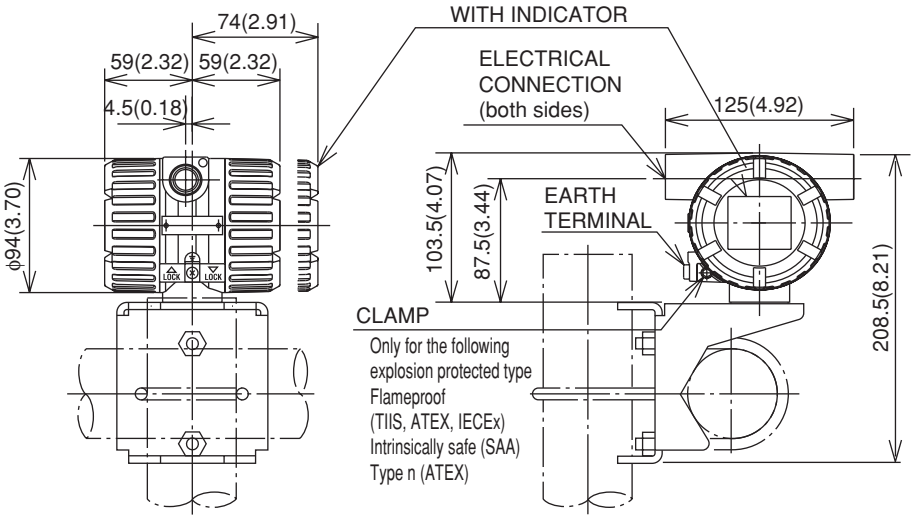
Model Code	DY100 /E1 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	220			
C	93.8			
CS	51.1			
D	210	225	228.6	254
H	354	361.5	363.3	376
H1	158			
T	18	24	23.9	31.8
J	175	185	190.5	200.2
N	8			
G	19	23	19	22.4
Weight kg	21	25	25.6	34.1

Model Code	DY150 /E1 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	270			
C	138.8			
CS	71			
D	280	305	279.4	317.5
H	406	418.5	405.7	424.5
H1	175			
T	22	28	25.4	36.6
J	240	260	241.3	269.7
N	8	12	8	12
G	23	25	22.4	22.4
Weight kg	40.4	50.4	43.4	61.4

Model Code	DY200 /E1 /R2			
Process Connection	BJ1	BJ2	BA1 BS1	BA2 BS2
L	310			
C	185.6			
CS	93.8			
D	330	350	342.9	381
H	446	456	452.5	471.5
H1	190			
T	22	30	28.4	41.1
J	290	305	298.5	330.2
N	12	12	8	12
G	23	25	22.4	25.4
Weight kg	62	69	72	97

■ **Remote Type Converter (DYA)**

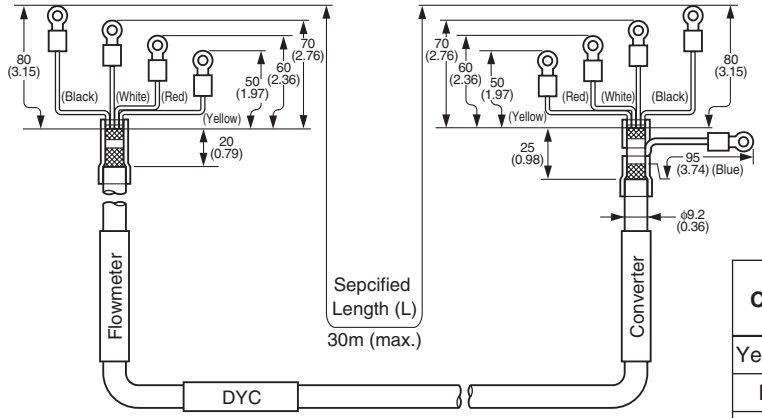
Unit: mm
(approx. inch)



Weight: 1.9 kg (4.19lb), 4.1 kg (9.04lb) for /E1.
Note: For flowmeters with indicator, add 0.2 kg.(0.44lb), 0.3 kg (0.66lb) for /E1.

■ **Signal Cable for Remote Type (DYC)**

Unit: mm
(approx. inch)

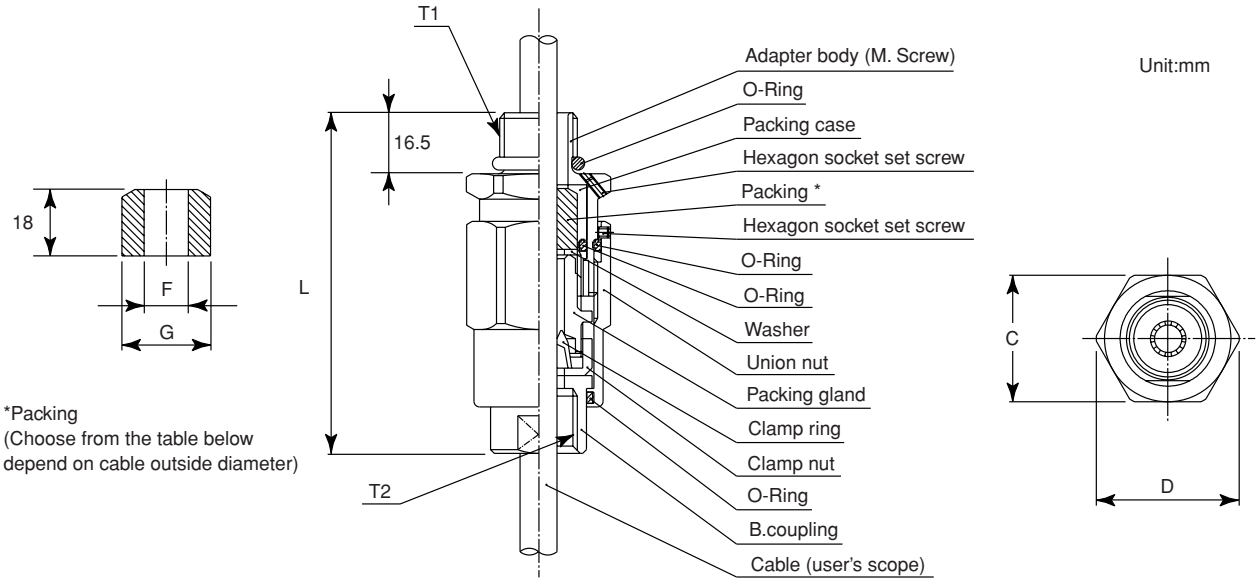


Cable Color and Terminal

Color	Terminal	
	Flow meter	Converter
Yellow(*1)	T	T
Red	A	A
White	B	B
Black	⏚	C
Blue		⏚

(*1) Only for /MV

■ **Flameproof Packing Adapter (Option code /G11,/G12)**



Size					Cable outer diameter	Packing dimensions		Identification mark	Weight (kg)
T1	T2	C	D	L		F	G		
G 1/2	G 1/2	35	39	94.5	ϕ8 to ϕ10	ϕ10.0	ϕ20.0	16 8-10	0.26
					ϕ10 to ϕ12	ϕ12.0		16 10-12	

Fig50

13. EXPLOSION PROTECTED TYPE INSTRUMENT

In this section, further requirements and differences for explosion proof type instrument are described except TIIS Flame proof. For explosion proof type instrument, the description in this chapter is prior to other description in this Instruction Manual.

WARNING

- Only trained persons use this instrument in industrial locations.

13.1 ATEX

WARNING

- Only trained persons use this instrument in industrial locations.
- Electrostatic charge may cause an explosion hazard.
  Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on coating face of product.

13.1.1 Technical Data

• Flameproof

Applicable Standard : EN60079-0: 2009, EN60079-1: 2007
Certificate : DEKRA 11ATEX0212X
Type of Protection:
Group: II
Category: 2G
Ex d IIC T6…T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
Ex d IIC T6 Gb (Remote Type Vortex Flow Converter)
Specification of Protection:
Process Temperature: (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Temperature Class	Process Temperature
T6	-29°C to +80°C
T5	-29°C to +100°C
T4	-29°C to +135°C
T3	-29°C to +200°C
T2	-29°C to +300°C
T1	-29°C to +450°C

T130101-1.eps

*1 Note: Use /HT version above 250°C

Temperature Class: T6 (Remote Type Vortex Flow Converter)
Ambient Temp.:
–29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
–40 to +60°C (Remote Type Vortex Flow Converter without indicator)
–30 to +60°C (Remote Type Vortex Flow Converter with indicator)
Power Supply: 10.5 to 42Vdc max.
Output Signal: Current Output; 4 to 20mAdc
Pulse output; On=2Vdc, 200mA
Off=42Vdc, 4mA
Special Fastener: Class A2-50 or more

• Intrinsically Safe

Applicable Standard : EN50014: 1997, EN50020: 2002
EN50284: 1999
Certificate : KEMA 01ATEX1082X
Type of protection: EEx ia IIC T4…T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
EEx ia IIC T4 (Remote Type Vortex Flow Converter)
Group: II
Category: 1G
Maximum Working Pressure: 16MPa (DY015 to DY200)
5MPa (DY250 and DY300)
Tamb.: -29 to +60°C (Integral Type Vortex Flowmeter)
-29 to +80°C (Remote Type Vortex Flow Detector)
-40 to +60°C (Remote Type Vortex Flow Converter)
(Integral Type Vortex Flowmeter)

Temperature Class	Ambient Temperature	Process Temperature
T4	60°C	≦135°C
T3	60°C	≦200°C
T2*	60°C	≦300°C
T1*	60°C	≦450°C

T130101-2.eps

*: Use /HT version above 260°C

(Remote Type Vortex Flow Detector)

Temperature Class	Ambient Temperature	Process Temperature
T4	80°C	≦135°C
T3	80°C	≦200°C
T2*	80°C	≦300°C
T1*	80°C	≦450°C

T130101-3.eps

*: Use /HT version above 260°C

Electrical data:
Supply and Output Circuit
(SUPPLY + and -, PULSE + and -);
Maximum Input Voltage Ui: 30 V
Maximum Input Current Ii: 165 mA
Maximum Input Power Pi: 0.9 W
Internal Capacitance Ci: 6nF
Internal Inductance Li: 0.15mH
For connection of DYA to DY-N:
Maximum cable capacitance: 160nF
Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

Special conditions for safe use

1. For process temperatures above 250°C the flow meters of the /HT version must be used.
2. Because the enclosures of the flow meters and the flow converter are made of aluminium alloy, when used in an potentially explosive atmosphere requiring apparatus of equipment categoly 1 G, they must be installed so, that even in the event of rare incidents, an ignition source due to impact of friction between the enclosure and iron/steel is excluded.

• Type of Protection "n"

Applicable Standard: EN60079-15: 2005, IEC60079-0: 2009
Type of protection: Ex nL IIC T4…T1 Gc (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
Ex nL IIC T4 Gc (Remote Type Vortex Flow Converter)
Group: II
Category: 3G
Degree of protection of enclosure: IP66/IP67
Ambient Temperature :
-29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
-40 to +60°C (Remote Type Vortex Flow Converter without indicator)
-30 to +60°C (Remote Type Vortex Flow Converter with indicator)
(Integral Type Vortex Flowmeter, Remote Type Vortex Flow Detector)

Temperature Class	Process Temperature
T4	-29°C to +135°C
T3	-29°C to +200°C
T2*	-29°C to +300°C
T1*	-29°C to +450°C

T130101-4.eps

*: Use /HT version above 250°C

Electrical data
Signal/Supply and Pulse circuit
Ui= 30Vdc, Ci= 6nF, Li= 0.15mH
Electrical Connection: ANSI 1/2 NPT female, ISO M20 X 1.5 female

13.1.2 Installation

⚠ WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- Use the suitable heat-resisting cables (over 90°C) for the digitalYEWFLO Model DY Series Vortex Flowmeter when the ambient temperature exceeds 60°C and/or the process temperature exceeds 200°C.
- The cable entry devices shall be certified in type of protection flame proof enclosure "d" and suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with certified blanking elements in type of protection flame proof enclose "d".

The grounding terminals are located on the inside and outside of the terminal area.
Connect the cable to grounding terminal in accordance with wiring procedure (1) or (2).

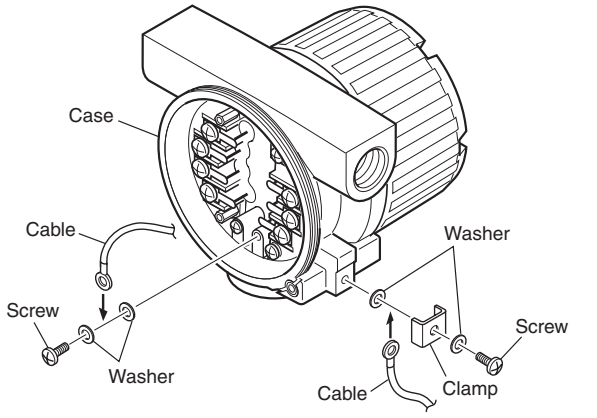


Figure 13.1.1 Wiring Procedure for Grounding Terminals

13.1.3 Operation

WARNING

- Wait 3 min. after power is turned off, before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

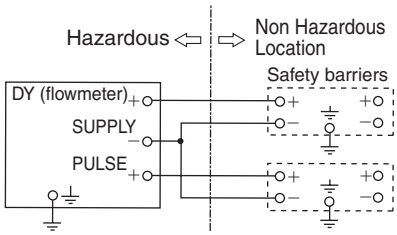
13.1.4 Maintenance and Repair

WARNING

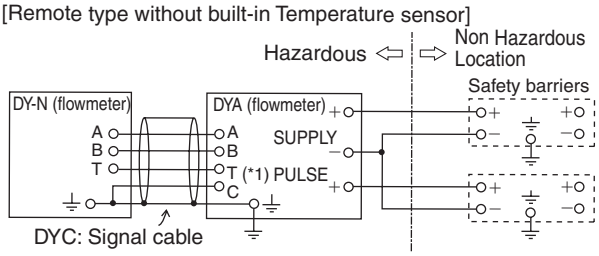
- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

13.1.5 Installation Diagram of Intrinsically safe (and Note)

[Integral type]



[Remote type without built-in Temperature sensor]



Note: In any safety barrier used output current must be limited by a resistor 'R' such that Io=Uo/R

Electric data:
Supply and Output Circuit (SUPPLY + and −, PULSE+ and −)
Maximum Input Voltage Ui: 30V
Maximum Input Current Ii: 165mA
Maximum Input Power Pi: 0.9W
Internal Capacitance Ci: 6nF
Internal Inductance Li: 0.15mH

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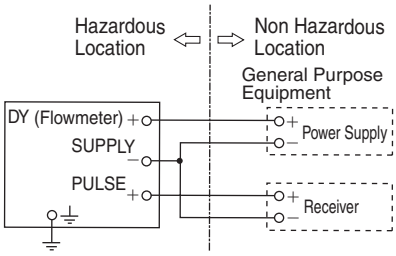
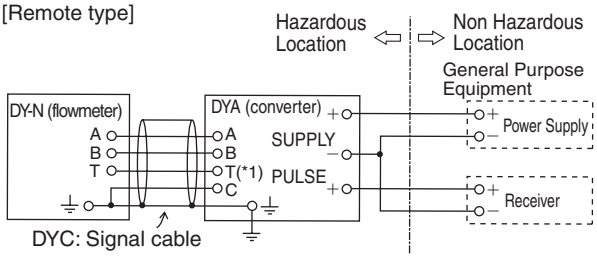
13.1.6 Installation Diagram of Type of Protection "n"

[Integral type]



[Remote type]



(*1): Wire for T termanal
With temperature sensor type: Installed
Without temperature sensor type: Not Installed

Electric data:
Maximum Input Voltage Ui: 30V
Internal Capacitance Ci: 6nF
Internal Inductance Li: 0.15mH

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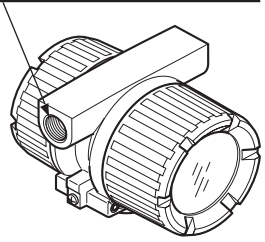
13.1.7 Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following codes.

Screw size	Marking
ISO M20 X 1.5 female	⚠ M
ANSI 1/2-14NPT female	⚠ N



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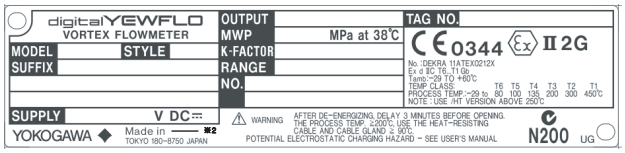
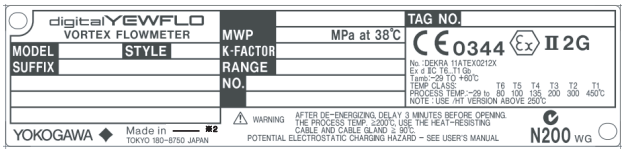
13.1.8 Name Plate

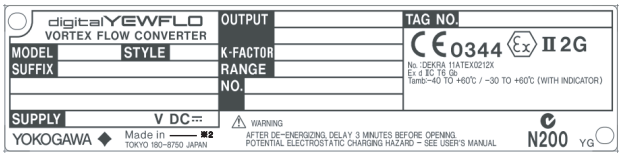
[Integral type, Flameproof]



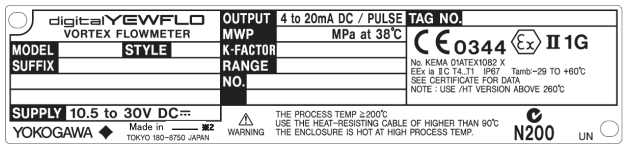
[Remote type detector, Flameproof]



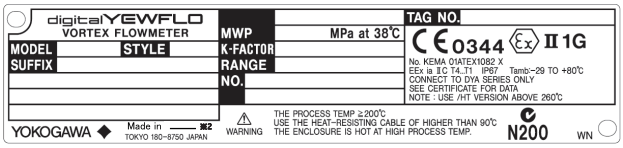
[Remote type converter, Flameproof]



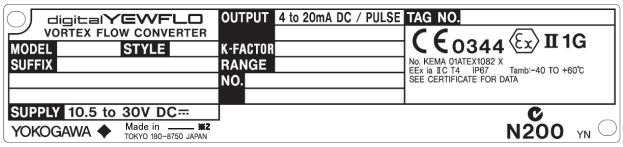
[Integral type, Intrinsically safe]



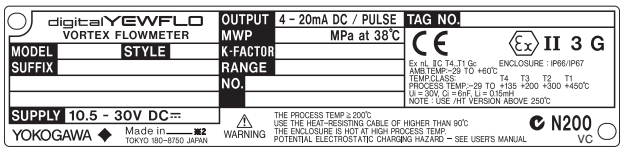
[Remote type detector, Intrinsically safe]



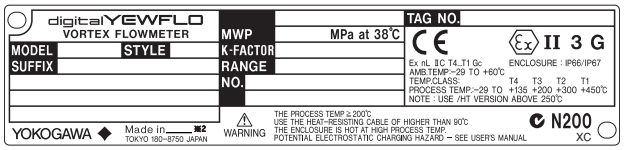
[Remote type converter, Intrinsically safe]



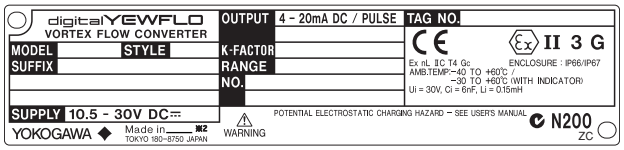
[Integral type, Type n protection]



[Remote type detector, Type n protection]



[Remote type converter, Type n protection]



MODEL: Specified model code
SUFFIX : Specified suffix code
STYLE: Style code
SUPPLY : Supply voltage
OUTPUT : Output signal
MWP : Maximum working pressure
K-FACTOR : Device-specific factor
RANGE: Specified range
NO.: Manufacturing serial number *1

*1) The first number in the second block of "NO." column is the last one number of the production year. For example, the year of production of the product engraved as follows is year 2012.
NO. S5K965926 2̲35 7
↑Produced in 2012

TAG NO. : Specified TAG No.
CE: CE marking
0344: The indentification number of the notified body.
II2G: Group II Category 2 Gas atmosphere
II1G: Group II Category 1 Gas atmosphere
II3G: Group II Category 3 Gas atmosphere

*2 The product - producing country

13.2 FM

13.2.1 Technical Data

• Explosion Proof

Applicable Standard: FM3660 1998, FM3611 1999, FM3615 1989, FM3810 1989, Including Supplement 1 1995, ANSI/NEMA 250 1991

Type of Protection: Explosionproof for Class I, Division 1, Groups A,B, C and D; Dust-ignition proof for Class II/III, Division 1, Groups E, F,and G.

"SEAL ALL CONDUITS 18 INCHES." " WHEN INSTALLED IN DIV.2, SEALS NOT REQUIRED"

Enclosure Rating: NEMA Type 4X

Temperature Code: T6

Ambient Temperature: -29 to 60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
-40 to 60°C (Remote Type Vortex Flow Converter)

Power Supply: 42Vdc max. (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Output Signal (Integral Type Vortex Flowmeter):
Current Output; 4 to 20mAdc
Pulse Output; On=2Vdc, 200mA
Off=42Vdc, 4mA

Output Signal (Remote Type Vortex Flow Detector):
Output Signal to Converter; 30Vp-p, 100μAp-p

Input/Output Signal (Remote Type Vortex Flow Converter):
Current Output; 4 to 20mAdc
Pulse Output; On=2Vdc, 200mA
Off=42Vdc, 4mA
Input Signal from Flowmeter; 30Vp-p, 100μAp-p

Maximum Working Pressure: 16MPa (DY015 to DY200)
5MPa (DY250 and DY300)

Electrical connection : ANSI 1/2 NPT female (Special)

• Intrinsically Safe

Applicable Standard: FM3600 1998, FM3610 2010, FM3611 2004, FM3810 2005, NEMA-250 1991, ANSI/ISA-60079-0: 2009, ANSI/ISA-60079-11: 2009

Type of Protection: Intrinsically safe for Class I, II, III, Div.1, Groups A, B, C, D, E, F and G,T4 and Class I, Zone 0, AEx ia IIC T4
Nonincendive for Class I, II, Div. 2, Groups A, B, C, D, F and G, Class III, Div.1, T4, and Class I, Zone 2, Group IIC, T4

Ambient Temperature: –29 to +60°C
(Integral Type Vortex Flowmeter)
–29 to +80°C
(Remote Type Vortex Flow Detector)
–40 to +60°C
(Remote Type Vortex Flow Converter)

Maximum Working Pressure: 16MPa (DY015 to DY200)
5MPa (DY250 and DY300)

Indoors and Outdoors: NEMA Type 4X

Electrical Parameters:Vmax=30Vdc, Imax=165mAdc, Pi=0.9W, Ci=12nF, Li=0.15mH

Electrical connection : ANSI 1/2 NPT female

13.2.2 Wiring

• Explosion proof

WARNING

- All wiring shall comply with National Electrical Code ANSI/NFPA 70 and Local Electrical Code.
- "SEAL ALL CONDUITS 18 INCHES" " WHEN INSTALLED DIV.2, SEALS NOT REQUIRED".

• Intrinsically Safe

NOTE

- The FM Approved Hand Held Communicator may be connected at any point in the loop between the digitalYEWFLO and the Control Equipment.

13.2.3 Operation

• Explosion proof

WARNING

- Note a warning label worded as follows.
  Warning: OPEN CIRCUIT BEFORE REMOVING COVER.
  INSTALL IN ACCORDANCE WITH THE INSTRUCTION MANUAL (IM) IF6A1-01E.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

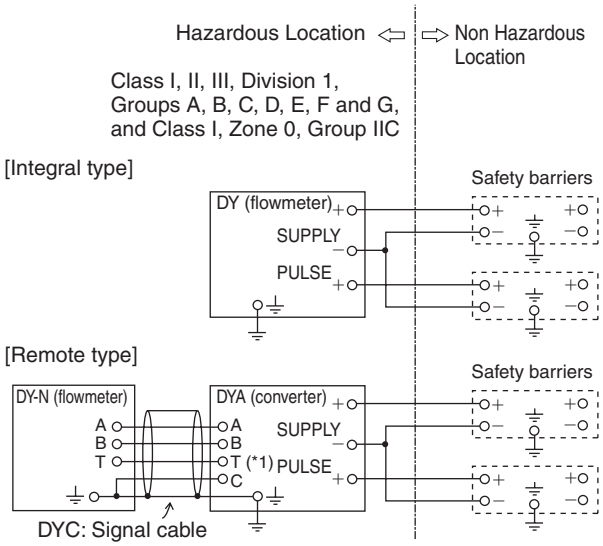
13.2.4 Maintenance and Repair

WARNING

- The instrument modification or part replacements by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of FM Approvals.

13.2.5 Installation Diagram

Intrinsically Safe (and WARNING)



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Electrical parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Vmax=30V Imax=165mA Pi=0.9W
Ci=12nF Li=0.15mH

Installation requirement between flowmeter, converter and Safety Barrier
Vt or Voc ≦ Vmax It or Isc ≦ Imax Po≦ Pi
Ca ≧ Ci+Ccable
La ≧ Li+Lcable
Vt, Voc, It, Isc, Voc, Ca and La are parameters of barrier.

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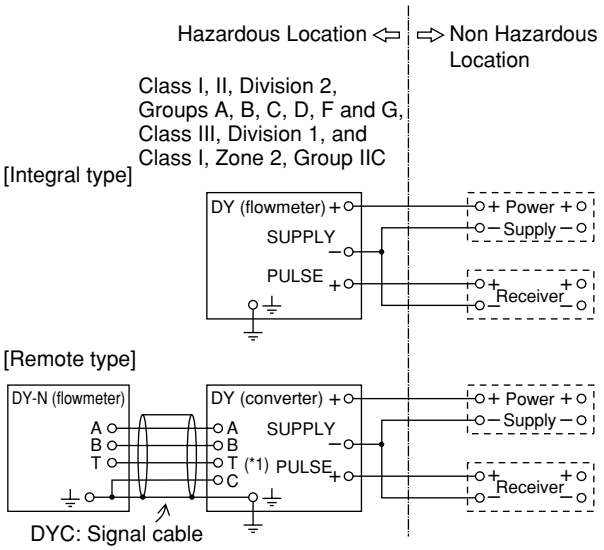
WARNING

- In any safety barrier used output current must be limited by a resistor 'R' such that Isc=Voc/R.
- Any Single FM Approved Barrier of multiple barriers FM Approved for this configuration who's parameters meet the above installation requirements.
- Input voltage of the safety barrier must be less than 250Vrms/Vdc.
- Installation should be in accordance with National Electrical Code, ANSI /NFPA70.
- Dust-tight conduit seal must be used when installed in class II and III environments.
- Do not alter drawing without authorization from FM.

Nonincendive (and WARNING)



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Non-incendive field wire parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Vmax=30V Imax=165mA Pi=0.9W
Ci=12nF Li=0.15mH

Installation requirement between flowmeter, converter and general purpose equirement.
Vt or Voc ≦ Vmax It or Isc ≦ Imax Po ≦ Pi
Ca ≧ Ci+Ccable La ≧ Li+Lcable
Vt, Voc, It, Isc, Po, Ca and La are nonincendive field wire parameters of general purpose equipment.

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WARNING

- The general purpose equipment must be FM approved with Nonincendive field wiring parameter which meet the above installation requirements.
- Installation should be in accordance with National Electric Code, ANSI/NFPA70.
- Dust-tight conduit seal must be used when installed in class II and III environments.
- Do not alter drawing without authorization from FM.

13.3 IECEx

WARNING

- Only trained persons use this instrument in industrial locations.
- Electrostatic charge may cause an explosion hazard.
  Avoid any actions that cause the generation of electrostatic charge, such as rubbing with a dry cloth on coating face of product.

13.3.1 Technical Data

• Flameproof

Applicable Standard : IEC60079-0: 2007-10, IEC60079-1: 2007-04
Certificate : IECEx DEK 11.0077X
Type of Protection:
Ex d IIC T6…T1 Gb (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
Ex d IIC T6 Gb (Remote Type Vortex Flow Converter)
Specification of Protection:
Process Temperature: (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Temperature Class	Process Temperature
T6	-29°C to +80°C
T5	-29°C to +100°C
T4	-29°C to +135°C
T3	-29°C to +200°C
T2	-29°C to +300°C
T1	-29°C to +450°C

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*1 Note: Use /HT version above 250°C

Temperature Class: T6 (Remote Type Vortex Flow Converter)
Ambient Tamp.:
–29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
–40 to +60°C (Remote Type Vortex Flow Converter without indicator)
–30 to +60°C (Remote Type Vortex Flow Converter with indicator)
Power Supply: 10.5 to 42Vdc max.
Output Signal: Current Output; 4 to 20mAdc
Pulse output; On=2Vdc, 200mA
Off=42Vdc, 4mA
Special Fastener: Class A2-50 or more

Special conditions for safe use

1. For process temperatures above 250°C the flow meters of the /HT version must be used.

13.3.2 Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- Use the suitable heat-resisting cables (over 90°C) for the digitalYEWFLO Model DY Series Vortex Flowmeter when the ambient temperature exceeds 60°C and/or the process temperature exceeds 200°C.
- The cable entry devices shall be certified in type of protection flame proof enclosure “d” and suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with certified blanking elements in type of protection flame proof enclose “d”.

The grounding terminals are located on the inside and outside of the terminal area.
Connect the cable to grounding terminal in accordance with wiring procedure (1) or (2).

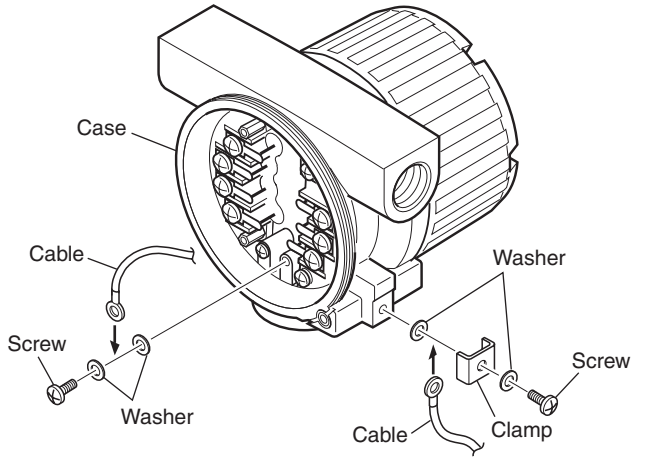


Figure 13.3.1 Wiring Procedure for Grounding Terminals

13.3.3 Operation

WARNING

- Wait 3 min. after power is turned off, before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

13.3.4 Maintenance and Repair

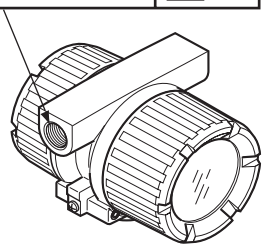
WARNING

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the certification.

13.3.5 Electrical Connection

The type of electrical connection is stamped near the electrical connection port according to the following codes.

Screw size	Marking
ISO M20 X 1.5 female	⚠ M
ANSI 1/2-14NPT female	⚠ N



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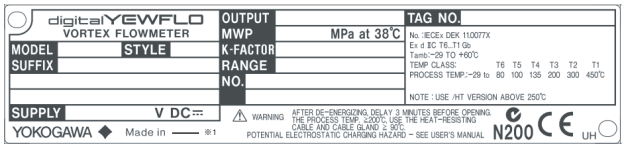
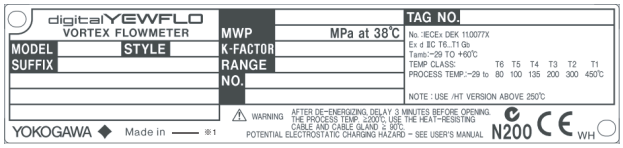
13.3.6 Name Plate

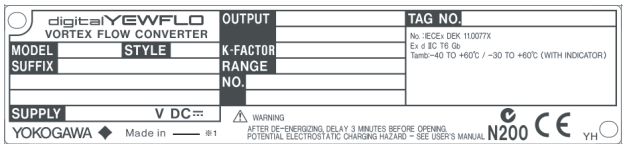
[Integral type, Flameproof]



[Remote type detector, Flameproof]



[Remote type converter, Flameproof]



MODEL: Specified model code
SUFFIX : Specified suffix code
STYLE: Style code
SUPPLY : Supply voltage
OUTPUT : Output signal
MWP : Maximum working pressure
K-FACTOR : Device-specific factor
RANGE: Specified range
NO.: Manufacturing serial number

TAG NO. : Specified TAG No.

*1 The product - producing country

13.4 CSA

13.4.1 Technical Data

• Explosion Proof

Applicable Standard: C22.1-98, C22.2 No.0-M1991, C22.2 No.4-04, C22.2 No.0.5-1982, C22.2 No. 25-1966, C22.2 No. 30-M1986, C22.2 No. 94-M1991, C22.2 No. 142-M1987, C22.2 No. 61010-1-04, ANSI/ ISA-12.27.01-2003

Certificate : 1166201

Type of Protection: Explosionproof for Class I, B, C and D; Class II, Groups E, F and G; Class III. For Class I, Division 2 location: "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED."

Enclosure : Type 4X

(Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Temperature Code	Ambient Temperature	Process Temperature
T6	60°C	≦85°C
T5	60°C	≦100°C
T4	60°C	≦135°C
T3	60°C	≦200°C
T2	60°C	≦300°C
T1	60°C	≦450°C

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Temperature Code: T6 (Remote Type Vortex Flow Converter)

Ambient Temperature: -29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
-40 to +60°C (Remote Type Vortex Flow Converter)

Power Supply: 42Vdc max. (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Converter)

Output Supply (Integral Type Vortex Flowmeter):
Current Output; 4 to 20mAdc
Pulse Output; on=2Vdc, 200mA
Off=42Vdc, 4mA

Output Signal (Remote Type Vortex Flow Detector):
Output Signal; 30Vp-p, 100μAp-p

Input/Output signal (Remote Type Vortex Flow Converter):
Current Output; 4 to 20mAdc
Pulse; On=2Vdc, 20mA
Off=42Vdc, 4mA
Input Signal; 30Vp-p, 100μAp-p

Maximum Working Pressure: 16MPa (DY015 to DY200)
5MPa (DY200 and DY300)

Electrical Connection: ANSI 1/2 female(Special)

• Intrinsically Safe

Type "n" and Non-incendive

Applicable Standard: C22.2 No. 0-M91, C22.2 No. 0.4-2004, C22.2 No. 157-M1987, C22.2 No. 213-M1987, C22.2 No. 1010.1-92, CAN/ CSA-E60079-0:02, CAN/CSA-E60079-11:02, CAN/CSA-E60079-15:02, ANSI/ ISA-12.27.01-2003

Certificate : 1198227

Type of Protection: Ex ia IIC T4...T1 and Ex nC IIC T4...T1 (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
Ex ia IIC T4 and Ex nC IIC T4 (Remote Type Vortex Flow Converter)

(Integral Type Flowmeter and Remote Type Vortex Flow Detector)

Temperature Code	Ambient Temperature	Process Temperature
T4	60°C	≦135°C
T3	60°C	≦200°C
T2	60°C	≦300°C
T1	60°C	≦450°C

T130401_2.EPS

Ambient Temperature: -29 to +60°C (Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)
-40 to +60°C (Remote Type Vortex Flow Converter)

Degree of Protection of Enclosure: IP67

Electrical Parameters: Ui=30Vdc, Ii=165mAdc, Pi=0.9W
Ci=12nF, Li=0.15mH

Electrical Connection: ANSI 1/2 NPT female

Type of Protection: Intrinsically Safe for Class I,II,III, Div.1, Groups A,B,C,D,E,F and G,
Non- incendive for Class I,II, DIV.2, Groups A,B,C,D,E,F and G, Class III, Div.1

(Integral Type Vortex Flowmeter and Remote Type Vortex Flow Detector)

Temperature Code	Ambient Temperature	Process Temperature
T4	60°C	≦135°C
T3	60°C	≦200°C
T2	60°C	≦300°C
T1	60°C	≦450°C

T130402.EPS

Temperature Code: T4 (Remote Type Vortex Flow Converter)

Ambient Temperature: -40 to 60°C

Enclosure: Type 4X

Electrical Parameters: Vmax=30Vdc, Imax=165mAdc, Pmax=0.9W, Ci=12nF, Li=0.15mH

13.4.2 Wiring

• **Explosion proof**

WARNING

- All wiring shall comply with Canadian Electrical Code Part I and Local Electrical Codes.
- In Hazardous locations, wiring shall be in conduit as shown in the figure.
- A SEAL SHALL BE INSTALLED WITHIN 50cm OF THE ENCLOSURE.
- When the equipment is installed in Division 2, "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED".

13.4.3 Operation

• **Explosion proof**

WARNING

- Note a warning label worded as follows.
  Warning: OPEN CIRCUIT BEFORE REMOVING COVER.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

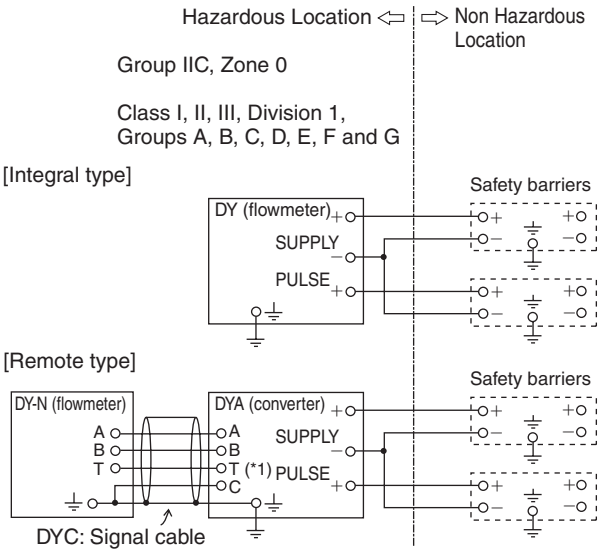
13.4.4 Maintenance and Repair

WARNING

- The instrument modification or part replacements by other than authorized representatives of Yokogawa Electric Corporation are prohibited and will void CSA Certification.

13.4.5 Installation Diagram Intrinsically Safe (and Note)

Intrinsically safe



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Electrical parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Ui (Vmax)=30 V Ii (Imax)=165 mA Pi (Pmax)=0.9W
Ci=12 nF Li=0.15 mH

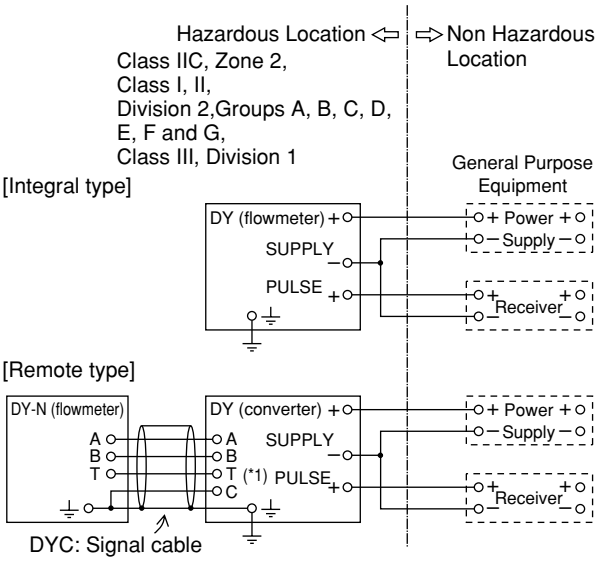
Installation requirements between flowmeter, converter and Safety Barrier
Uo ≦ Ui Io ≦ Ii Po ≦ Pi Co ≧ Ci+Ccable
Lo ≧ Li+Lcable
Voc ≦ Vmax Isc ≧ Imax Ca ≧ Ci+Ccable
La ≧ Li+Lcable
Uo, Io, Po, Co, Lo, Voc, Isc, Ca and La are parameters of barrier.

F130401_1.EPS

WARNING

- In any safety barrier used output current must be limited by a resistor 'R' such that Io=Uo/R or Isc=Voc/R.
- The safety barrier must be CSA certified.
- Input voltage of the safety barrier must be less than 250Vrms/Vdc.
- Installation should be in accordance with Canadian Electrical Code Part I.
- Dust-tight conduit seal must be used when installed in class II and III environments.
- Do not alter drawing without authorization from CSA.

Type “n” and Non-incendive



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Non-incendive field wire parameters of vortex flowmeter (DY) and vortex flow converter (DYA).
Ui (Vmax)=30 Ii (Imax)=165mA Pi (Pmax)=0.9W
Ci=12nF Li=0.15mH

Installation requirement between flowmeter, converter and general purpose equirement.
Uo ≦ Ui Io ≦ Ii Po ≦ Pi Co ≧ Ci+Ccable
Lo ≧ Li+Lcable
Voc ≦ Vmax Isc ≦ Imax Ca ≧ Ci+Ccable
La ≧ Li+Lcable

Uo, Io, Po, Co Voc, Isc, Ca and La are nonincendive field wire parameters of general purpose equipment.

F130401_2.EPS

WARNING

- The general purpose equipment must be CSA certified as the equipment which have type n or non-incendive field wire parameters.
- Installation should be in accordance with Canadian Electrical Code Part I.
- Dust-tight conduit seal must be used when installed in class II and III environments.
- Do not alter drawing without authorization from CSA.

13.4.6 Dual Seal (Option: /CF11, /CS11)

Dual Seal:
Certified by CSA to the requirement of ANSI/ISA 12.27.01
No additional sealing required.
Primary seal failure annunciation: at the O-ring seal portion between shedder bar and amplifier housing.

13.5 TIIS

Certificate:

Model	Shedder bar Material	Integral Type Flowmeter		Remote Type Detector
		N (None Indicator)	D (With Indicator)	N (None Indicator)
DY015 DY025/R1 DY040/R2	E	TC14901	TC14912	TC14923
	X	TC18903	TC18914	TC18925
DY025 DY040/R1 DY050/R2	E	TC19504	TC19513	TC19522
	X	TC18904	TC18915	TC18926
DY040 DY050/R1 DY080/R2	E	TC19505	TC19514	TC19523
	X	TC18905	TC18916	TC18927
DY050 DY080/R1 DY100/R2	E	TC19506	TC19515	TC19524
	X	TC18906	TC18917	TC18928
DY080 DY100/R1 DY150/R2	E	TC19507	TC19516	TC19525
	X	TC18907	TC18918	TC18929
DY100 DY150/R1 DY200/R2	E	TC19508	TC19517	TC19526
	X	TC18908	TC18919	TC18930
DY150 DY200/R1	E	TC19509	TC19518	TC19527
	X	TC18909	TC18920	TC18931
DY200	E	TC19510	TC19519	TC19528
	X	TC18910	TC18921	TC18932
DY250	E	TC19511	TC19520	TC19529
DY300	E	TC19512	TC19521	TC19530

Model	Shedder bar Material	Remote Type Converter	
		N (None Indicator)	D (With Indicator)
DYA		TC14934	TC14935

T130403.EPS

	Integral Type Flowmeter		Remote Type Flowmeter	
	None Indicator	With Indicator	Detector	Converter
Construction	Ex d IIC T6	←	←	←
	Flame Proof Approval	←	←	←
Amb.Temp	-20°C up to -60°C	←	←	←
Rating	Maximum power supply vortage: DC42V Current Signal: DC4-20mA Pulse Signal: ON : 2V 200mA OFF : 42V 4mA		Output Voltage: 30Vp-p Output Current: 100μ Ap-p	Maximum power supply vortage: DC42V Current Signal: DC4-20mA Pulse Signal: ON : 2V 200mA OFF : 42V 4mA Input Signal: 30V p-p,100μ A p-p Resistance Temp, Sensor Input: Pt1000Ω at 0°C Specified Current: less than 1mA

T130404.EPS

* In case that ambient temperature exceeds 50 degC, use heat-resistant cables with maximum allowable temperature of 70 degC or above.

13.6 SAA

WARNING

Only trained persons use this instrument in industrial locations.

13.6.1 Technical Data

• **Intrinsically Safe**
Type n

Applicable Standard: AS 2380.1-1989, AS2380.7-1987, AS2380.9-1991
Certificate : AUS Ex 2611X
Type of Protection: Ex ia IIC T4 IP67 (Integral Type Flowmeter, Remote Type Flowmeter and Remote Type Converter)
Hazardous Area: Class I, Zone 0
Maximum Input Voltage (Ui)=30Vdc
Maximum Input Current (Ii)=165mAdc
Maximum Input Power (Pi)=0.9W
Internal Capacitance (Ci)=37nF
Internal Inductance (Li)=0mH
Ambient Temperature: -20 to +60°C

Type of Protection: Ex n IIC T4 IP67 (Integral Type Flowmeter, Remote Type Flowmeter and Remote Type Converter)
Hazardous Area: Class I, Zone 2
Maximum Input Voltage (Ui)=30Vdc
Ambient Temperature: -20°C to +80°C
Electrical Connection : ANSI 1/2 NPT female, ISO M20X1.5 female.

13.6.2 Installation

WARNING

- All wiring shall comply with local installation requirements and local electrical code.
- Use the suitable heat-resisting cables for the digitalYEWFLO Series Vortex Flowmeter when the process temperature exceeds +200°C.
- In hazardous locations, the cable entry devices shall be certified flame proof type, suitable for the conditions of use and correctly installed.
- Unused apertures shall be closed with suitable flameproof certified blanking elements.

13.6.3 Operation

WARNING

- Open circuit before opening the covers.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous locations.

13.6.4 Maintenance and Repair

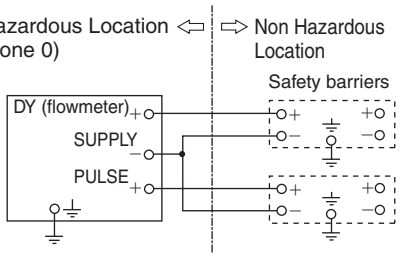
WARNING

- The instrument modification or parts replacements by other than authorized representative of Yokogawa Electric Corporation are prohibited and will void the certification.

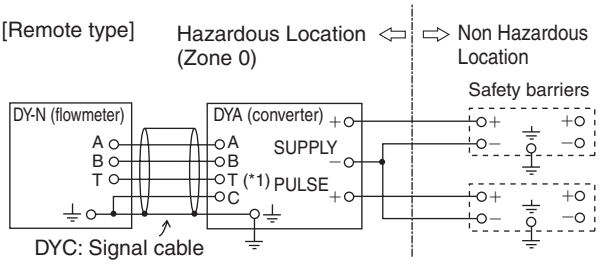
13.6.5 Installation Diagram

Intrinsically Safe

[Integral type]



[Remote type]



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

Electrical parameters:
Ui=30V Ii=165mA Pi=0.9W
Ci=37nF Li=0mH

Installation Requirements between Flowmeter, Converter and Safety Barrieres:
Uo ≦ Ui Io ≦ Ii Po ≦ Pi Co ≧ Ci+Ccable
Lo ≧ Li+Lcable
Uo, Io, Co, and Lo are parameters of safety barrier.
Ccable and Lcable are the maximum allowable cable parameters.

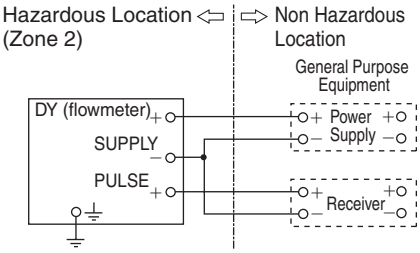
F130301_1.EPS

WARNING

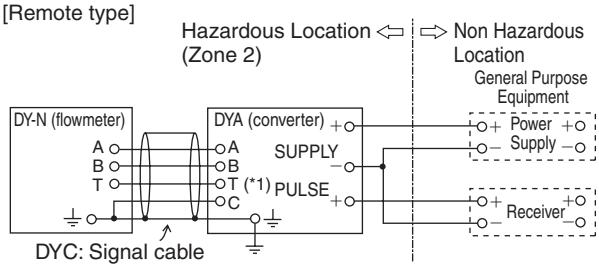
- The safety barrier must be SAA certified.
- Input voltage of the safety barrier must be less than 250Vrms/Vdc.
- In any safety barriers used the output current must be limited by a resistor 'R' such that Io=Uo/R.

Type "n"

[Integral type]



[Remote type]



(*1) Wire for T terminal
With temperature sensor type : installed
Without temperature sensor type: not installed

F130301_2.EPS

WARNING

Output voltage of power supply must not exceed 30Vdc and will void the certification.

13.6.6 Data Plate

Intrinsically safe and Type "n"

WARNING

- The specifications of Intrinsically safe type and Type n are described (engraved) on these data plates. For use of SAA, select a specification either Intrinsically safe type (Ex ia) or Type n (Ex n), then **erase unnecessary specification at the customer side.**
  Once a specification has been selected, never it can be changed again. (ex. Never use the flowmeter as Type n if it has selected Intrinsically safe type firstly.)

14. PRESSURE EQUIPMENT DIRECTIVE

This chapter is described further requirements and notices concerning the PED (Pressure Equipment Directive). The description in this chapter is prior to other description in this User's Manual.

(1) Technical Data

Type of Equipment: Piping
Type of Fluid: Liquid and Gas
Group of Fluid: 1 and 2

Model	DN(mm)*	PS(MPa)*	PS-DN(MPa-mm)	CATEGORY**
DY015	15	**42**	630	Article 3,*** Paragraph 3
DY025	25	**42**	1050	Article 3,*** Paragraph 3
DY040	40	**42**	1680	II
DY050	50	**42**	2100	II
DY080	80	**42**	3360	II
DY100	100	**42**	4200	II
DY150	150	**42**	6300	II
DY200	200	**42**	8400	III
DY250	250	**42**	10500	III
DY300	300	**42**	12600	III
DY400	400****	**25**	10000	III

T140001.EPS

* PS: Maximum allowable pressure for Flow Tube
DN: Nominal size

** Referred to Table 6 covered by ANNEX II of EC Directive on Pressure Equipment Directive 97/23/EC

*** DY015 and DY025 are not attached CE mark of PED because they do not under CE mark of PED.

**** Special-order product

(2) Installation

WARNING

- Please tighten the bolts for piping-joint according to the prescribed torque values.
- Please take measure to protect the flowmeters from forces caused by vibration through piping.

(3) Operation

WARNING

- The temperature and pressure of fluid should be applied under the normal operating condition.
- The ambient temperature should be applied under the normal operating condition.
- Please pay attention to prevent the excessive pressure like water hammer, etc. When water hammer is to be occurred, please take measures to prevent the pressure from exceeding PS(maximum allowable pressure) by setting the safety valve, etc. at the system and the like.
- When external fire is to be occurred, please take safety measures at the device or system not to influence the flowmeters.
- Please pay attention not to be abrade the metal pipe, when the fluid to abrade the lining such as slurry and sand are contained.

INSTALLATION AND OPERATING PRECAUTIONS FOR TIIS FLAMEPROOF EQUIPMENT

Apparatus Certified Under Technical Criteria
(IEC-compatible Standards)

1. General

The following describes precautions on electrical apparatus of flameproof construction (hereinafter referred to as flameproof apparatus) in explosion-protected apparatus.

Following the Labour Safety and Health Laws of Japan, flameproof apparatus is subjected to type tests to meet either the technical criteria for explosionproof electrical machinery and equipment (standards notification no. 556 from the Japanese Ministry of Labour) (hereinafter referred to as technical criteria), in conformity with the IEC Standards, or the “Recommended Practice for Explosion-Protected Electrical Installations in General Industries,” published in 1979. These certified apparatus can be used in hazardous locations where explosive or inflammable gases or vapours may be present.

Certified apparatus includes a certification label and an equipment nameplate with the specifications necessary for explosion requirements as well as precautions on explosion protection. Please confirm these precautionary items and use them to meet specification requirements.

For electrical wiring and maintenance servicing, please refer to “Internal Wiring Rules” in the Electrical Installation Technical Standards as well as “USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry,” published in 1994.

To meet flameproof requirements, equipment that can be termed “flameproof” must:

(1) Be certified by a Japanese public authority in accordance with the Labour Safety and Health Laws of Japan and have a certification label in an appropriate location on its case, and
(2) Be used in compliance with the specifications marked on its certification label, equipment nameplate and precautionary information furnished.

2. Electrical Apparatus of Flameproof Type of Explosion-Protected Construction

Electrical apparatus which is of flameproof construction is subjected to a type test and certified by the Japanese Ministry of Labour aiming at preventing explosion caused by electrical apparatus in a factory or any location where inflammable gases or vapours may be present. The flameproof construction is of completely enclosed type and its enclosure shall endure explosive pressures in cases where explosive gases or vapours entering the enclosure cause explosion. In addition, the enclosure construction shall be such that flame caused by explosion does not ignite gases or vapours outside the enclosure.

In this manual, the word "flameproof" is applied to the flameproof equipment combined with the types of protection "e", "o", "i", and "d" as well as flameproof equipment.

3. Terminology

(1) Enclosure

An outer shell of an electrical apparatus, which encloses live parts and thus is needed to configure explosion-protected construction.

(2) Shroud

A component part which is so designed that the fastening of joint surfaces cannot be loosened unless a special tool is used.

(3) Enclosure internal volume

This is indicated by:— the total internal volume of the flameproof enclosure minus the volume of the internal components essential to equipment functions.

(4) Path length of joint surface

On a joint surface, the length of the shortest path through which flame flows from the inside to outside of the flameproof enclosure. This definition cannot be applied to threaded joints.

(5) Gaps between joint surfaces

The physical distance between two mating surfaces, or differences in diameters if the mating surfaces are cylindrical.

Note: The permissible sizes of gaps between joint surfaces, the path length of a joint surface and the number of joint threads are determined by such factors as the enclosure’s internal volume, joint and mating surface construction, and the explosion classification of the specified gases and vapours.

4. Installation of Flameproof Apparatus

(1) Installation Area

Flameproof apparatus may be installed, in accordance with applicable gases, in a hazardous area in Zone 1 or 2, where the specified gases are present. Those apparatus shall not be installed in a hazardous area in Zone 0.

Note: Hazardous areas are classified in zones based upon the frequency of the appearance and the duration of an explosive gas atmosphere as follows:
Zone 0: An area in which an explosive gas atmosphere is present continuously or is present for long periods.
Zone 1: An area in which an explosive gas atmosphere is likely to occur in normal operation.
Zone 2: An area in which an explosive gas atmosphere is not likely to occur in normal operation and if it does occur it will exist for a short period only.

(2) Environmental Conditions

The standard environmental condition for the installation of flameproof apparatus is limited to an ambient temperature range from –20°C to +40°C (for products certified under Technical Criteria). However, some field-mounted instruments may be certified at an ambient temperature up to +60°C as indicated on the instrument nameplates. If the flameproof apparatus are exposed to direct sunshine or radiant heat from plant facilities, appropriate thermal protection measures shall be taken.

5. External Wiring for Flameproof Apparatus

Flameproof apparatus require cable wiring for their electrical connections. For cable wiring, cable glands (cable entry devices for flameproof type) to wiring connections shall be attached. All non-live metal parts such as the enclosure shall be securely grounded. For details, see the “USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry,” published in 1994.

(1) Cable Wiring

- For cable wiring, cable glands (cable entry devices for flameproof type) specified or supplied with the apparatus shall be directly attached to the wiring connections to complete sealing of the apparatus.
- Screws that connect cable glands to the apparatus are those for G-type parallel pipe threads (JIS B 0202) with no sealing property. To protect the apparatus from corrosive gases or moisture, apply nonhardening sealant such as liquid gaskets to those threads for waterproofing.
- Specific cables shall be used as recommended by the “USER’S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry,” published in 1994.
- In necessary, appropriate protective pipes (conduit or flexible pipes), ducts or trays shall be used for preventing the cable run (outside the cable glands) from damage.
- To prevent explosive atmosphere from being propagated form Zone 1 or 2 hazardous location to any different location or non-hazardous location through the protective pipe or duct, apply sealing of the protective pipes in the vicinity of individual boundaries, or fill the ducts with sand appropriately.
- When branch connections of cables is made, a flameproof or increased-safety connection box shall be used. In this case, flameproof or increased-safety cable glands meeting the type of connection box must be used for cable connections to the box.

6. Maintenance of Flameproof Apparatus

To maintain the flameproof apparatus, do the following. (For details, see Chapter 10 "MAINTENANCE OF EXPLOSION-PROTECTED ELECTRICAL INSTALLATION" in the USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry.)

(1) Maintenance servicing with the power on.

Flameproof apparatus shall not be maintenance-serviced with its power turned on. However, in cases where maintenance servicing is to be conducted with the power turned on, with the equipment cover removed, always use a gas detector to check that there is no explosive gas in that location. If it cannot be checked whether an explosive gas is present or not, maintenance servicing shall be limited to the following two items:

(a) Visual inspection
Visually inspect the flameproof apparatus, metal conduits, and cables for damage or corrosion, and other mechanical and structural defects.

(b) Zero and span adjustments
These adjustments should be made only to the extent that they can be conducted from the outside without opening the equipment cover. In doing this, great care must be taken not to cause mechanical sparks with tools.

(2) Repair

If the flameproof apparatus requires repair, turn off the power and transport it to a safety (non-hazardous) location. Observe the following points before attempting to repair the apparatus.

(a) Make only such electrical and mechanical repairs as will restore the apparatus to its original condition. For the flameproof apparatus, the gaps and path lengths of joints and mating surfaces, and mechanical strength of enclosures are critical factors in explosion protection. Exercise great care not to damage the joints or shock the enclosure.

(b) If any damage occurs in threads, joints or mating surfaces, inspection windows, connections between the transmitter and terminal box, shrouds or clamps, or external wiring connections which are essential in flameproofness, contact Yokogawa Electric Corporation.

CAUTION

Do not attempt to re-process threaded connections or refinish joints or mating surfaces.

(c) Unless otherwise specified, the electrical circuitry and internal mechanisms may be repaired by component replacement, as this will not directly affect the requirements for flameproof apparatus (however, bear in mind that the apparatus must always be restored to its original condition). If you attempt to repair the flameproof apparatus, company-specified components shall be used.

(d) Before starting to service the apparatus, be sure to check all parts necessary for retaining the requirements for flameproof apparatus. For this, check that all screws, bolts, nuts, and threaded connections have properly been tightened.

(3) Prohibition of specification changes and modifications

Do not attempt to change specifications or make modifications involving addition of or changes in external wiring connections.

7. Selection of Cable Entry Devices for Flameproof Type

IMPORTANT

The cable glands (cable entry devices for flameproof type) conforming to IEC Standards are certified in combination with the flameproof apparatus. So, Yokogawa-specified cable entry devices for flameproof type shall be used to meet this demand.

References:

(1) Type Certificate Guide for Explosion-Protected Construction Electrical Machinery and Equipment (relating to Technical Standards Conforming to International Standards), issued by the Technical Institution of Industrial Safety, Japan

(2) USER'S GUIDELINES for Electrical Installations for Explosive Gas Atmospheres in General Industry (1994), issued by the Japanese Ministry of Labour, the Research Institute of Industrial Safet

REVISION RECORD

Title : Model DY Vortex Flowmeter

Model DYA Vortex Flow Converter

Manual No. : IM 01F06A00-01E

Edition	Date	Page	Revised Item	
3rd	Jun. 2002	1-1	1.1	Change Figure1.1(b).
		2-2	2.2	Change the process temperature range and ambient temperature.
		2-3	2.2	Add Pressure Equipment Directive, Change Figure 2.2.1.
		2-5	2.3	Change Table 2.3.1 “Body” of Cryogenic Version.
		2-6, 2-7	2.4	Change the process temperature range and ambient temperature.
		2-9	2.4	Change the process temperature range.
		2-10	2.4	Change Figure 2.4.1 , 2.4.2.
		4-2	4.2	Add the description of Table 4.1.
		6-1	6.3	Change the contents of parameter lists.
		6-6	6.3	Change a table of parameter list.
		6-10	6.4	Add the description of “B50 A/OUT SELECT”.
		7-3	7.2.2	Change a tuning method.
		9-1	9.1.1	Change the process temperature and ambient temperature.
		9-3	9.1.6	Change Data Plate.
		9-4	9.2.1	Change the process temperature and ambient temperature.
		9-5	9.2.5	Correct “WARNING” and Installation Diagram of Non incendive.
		9-6	9.2.6	Change Data Plate.
		9-8	9.4.1	Change the process temperature and ambient temperature.
		9-10	9.4.5	Correct the Installation Diagram of Non incendive.
		9-11	9.4.6	Change Data Plate.
		10-1	10	Change the technical data.
4th	Sep. 2003	2-4	2.3	Add BS1 to 5.
		2-5		Table 2.3.2 Add BS1 to 5.
		2-8, 2-9	2.4	Add Hydrostatic Pressure Test, etc.
		2-11	2.5	Table 2.5.1 Change the value for size 40 mm.
		3-10	3.7.3	Add the description.
		4-1	4.2	Figure 4.2 Add the description.
		4-3	4.4	Figure 4.5 Add the description.
		5-9	5.5	Figure 5.5 Add the description.
5th	Apr. 2004	i	CONTENTS Reconfiguration.	
		iv	Add symbol mark, revision.	
		vi	Revision.	
		1-1	Revision.	
		2-1/22	Revision of Specification, Move to Chapter 9.	
		3-1/10	Revision, Move to Chapter 2.	
		3-9	Revision, Move to Chapter 7.	
		3-10	Add IMPORTANT, Revision, Move to Chapter 7.	
		4-1/6	Move to Chapter 3.	
		4-4/5	Revision, Move to Chapter 3.	
		5-1/24	Revision, Move to Chapter 4.	
		6-1/17	Revision, Move to Chapter 5.	
		7-1/4	Change Chapter name MAINTENANCE to OPERATION.	
		9-1/11	Revision, Move to Chapter 10.	
		10-1	Move to Chapter 11.	
		8-5/6	8.3 moves to Chapter 7.	
		8-7/8	8.4 moves to Chapter 7.	

Edition	Date	Page	Revised Item
6th	Jan. 2005	5-6	Correction.
		5-8	Added a parameter.
		5-16	Added a parameter explanation and corrections.
		9-5	Revision (MS code).
		9-8	Revision (Option Specification).
		9-13	Revision.
		9-18/25	Revision.
		10-7	Revision.
		10-8	Revision.
		10-9	Revision.
7th	July 2005	2-5	Added a “CAUTION” about heat insulating material installation.
		7-8	Revised the formura 7.14.3.
		9-3	Changed the EMC Conformity Standards No..
		9-6	Deleted DIN64 and DIN100 (Suffix Code: BD5 and BD6).
		10-1/13	Added Applicable Standard No.and Certificate No. to each Approval body.
8th	Nov. 2005	2-7	Revision: Vertical Installation.
		3-5	Revision: 7.
		4-21-25	Revision.
		4-24	Revision <K36>.
		5-15	H27: Revision.
		5-16	J10, J20: Revision.
		8-2	Revision.
		9-5	Revision of specification.
		9-6	Revision of specification.
		9-7	Revision of specification.
		9-8	Revision of specification.
		9-10	Table 9.4.3: Revision.
		9-11	Revision of specification.
		9-12	Revision of specification.
		9-14	Table 9.5.1: Revision.
		9-19	Tables: Revision.
		9-20	Tables: Revision.
		9-22	Tables: Revision.
		9-23	Tables: Revision.
		9-24	Revision.
9th	May. 2006	2-2	Revision.
		2-3	Add a note to "Valve position (T-type pipe exist)" and "Heat - Insulation".
		3-4	Revision: Figure 3.6.
		4-9	Revision: Figure 4.5.
		5-1	Add a "IMPORTANT" to 5.2.
		5-5	Add Data Range to <E20>.
		5-13	Add descriptions to <E20>.
		5-14	Add a "IMPORTANT" to <F52>.
		7-2	Revision figures.
		7-3	Revision figures.
		7-5	Revision figures.
		Chap.9	Revision, Added optional items, etc.

Edition	Date	Page	Revised Item
10th	Nov. 2006	2-2	Add discviptions of /R2.
		4-14	Delete 4.6.2.
		5-13	Delete a note.
		7-1	Add to CAUTION.
		7-4	Add to CAUTION.
		9-5	Revisions.
		9-6	Add /R2.
		9-7	Add /R2.
		9-8	Revisions.
		9-9	Revision.
		9-10	Add /R2.
		9-11	Revisions.
		9-14	Add /R2.
		9-15	Add /R2.
		9-16	Add /R2.
		9-17	Add /R2.
		9-18	Add /R2.
		9-27	Revisions.
		9-28	Revisions.
		9-29/30	Add /R2.
		10-4	Revision.
		10-13	Revisions.
11th	Aug. 2008	3-3	Additions.
		4-1	Additions.
		4-21	Additions.
		5-2 to 8	Additions.
		5-11	Additions.
		5-13	Additions.
		5-14	Additions.
		6-1	Revisions of Figure 6.1.
		7-4	Additions of Table 7.1.
		7-5	Revisions of Figure 7.3.
		7-7, 8	Corrections.
		9-11 to 13	Additions.
		9-14, 15	Revisions.
		9-16	Corrections.
		10-1 to 12	Chap.10 Revisions.

Edition	Date	Page	Revised Item
12th	Mar. 2010	1-1	Figure 1 Revision.
		2-5	2.4 Revision.
		2-7	Table 2.3 Revision.
		3-2	Figure 3.2 Revision.
		3-3	Table 3.1 Revision.
		3-4	Figure 3.5 Revision.
		4-9	Figure 4.4 Revision.
		4-13 to 21	4.6 Revision.
		5-4	D10 Revision.
		5-8	K45 Revision.
		5-12	NOTE Revision.
		5-15	NOTE Revision.
		6-1	NOTE Revision.
		6-3	6.2.1 Revision.
		9-2	9.2 Revision.
		9-5 to 9-6	9.3 Revision.
		9-7 to 9-8	9.4.1 Revision and add an option specification.
		9-9	9.4.2 Revision.
		9-16	Revision.
		9-6 to 9-37	Revision and add /E1 drawings.
		10-11	10.5 Revision.
13th	Dec. 2011	5-12	Manual Change No. 10-005-1E
		5-15	
		10-1	
		10-2	
		10-3-1	
		10-3-2	
		vi	Add note (6).
		4-1	Revision and delete (Table 4.1)
		5-13	Revision (E30)
		7-4	Revision (Table 7.4)
		7-6	Revision (7.6 title)
		9-2	Revision (Specification changes)
		9-5	Revision (Specification changes, add MS Code)
		9-6	Revision (Specification changes, Table 9.3.1)
		9-7	Page alignment Table 9.3.2
		9-10	Revision (Specification changes, Table for MV)
		9-11/14	Revision (Specification changes, for Explosion proof)
		10-1/12	Revision (Specification changes, for Explosion proof)
		EX-B03E_2	Revision (Specification changes, for TIIS Explosion proof)

Edition	Date	Page	Revised Item
14th	Mar. 2012	vi	Add Warning; Wet location
		1-1	Correction (Chapter No.)
		2-6	Correction (Chapter No.)
		3-3	Add Note, *3
		5-5	Correction (unit)
		5-7	Correction (time unit)
		5-8	Correction (K45)
		5-12	Add parameter item D40, Correction D43
		5-13, 14	Correction (unit)
		5-16	Revision (J40)
		Chapter 7	Revision (HART5 and DTM menu tree)
		Chapter 8	Add HART7
		9-1	Add Note
		9-2	Minor amendment (ex.Chapter number)
		10-2	Revision 10.1
		10-4	Revision (10.5 Vortex Shedder Removal)
		10-7	Add Footnote
		Chapter 12	Add HART7, Revision of Ex-proof descriptions
		Chapter 13	Revision of Ex-proof descriptions
15th	Aug. 2012	2-3	Correction (Figure, Word)
		2-5	Correction (Word)
		3-7, 3-8	Correction
		5-2, 5-4, 5-5, 5-15	Correction
		7-5	Correction (Word)
		7-7	Add (RW)
		8-7, 8-8	Correction
		8-15	Correction (Word)
		8-18	Add (RW)
		8-19	Add (R)
		10-2	Revision
		10-4	Revision (Table 10.1)
		10-6	Correction
		12-3	Add table.
		12-5	Revision
		12-6	Revision
		12-8	Revision
		12-9	Revision (Note7, 8, 9)
		12-11	Correction
		12-12 to 12-14	Revision (Explosionproof)
		12-15	Add DY250/HT and DY300/HT
		12-19	Revision
		12-20 to 12-38	Revision
		13-1, 13-2, 13-4	Revision for ATEX
		13-5	Correction for FM
		13-7, 13-8	Add IECEx explosion proof
		13-12	Revision for the table of IECEx.